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SCHOOL SHOP

SEPTEMBER 1984

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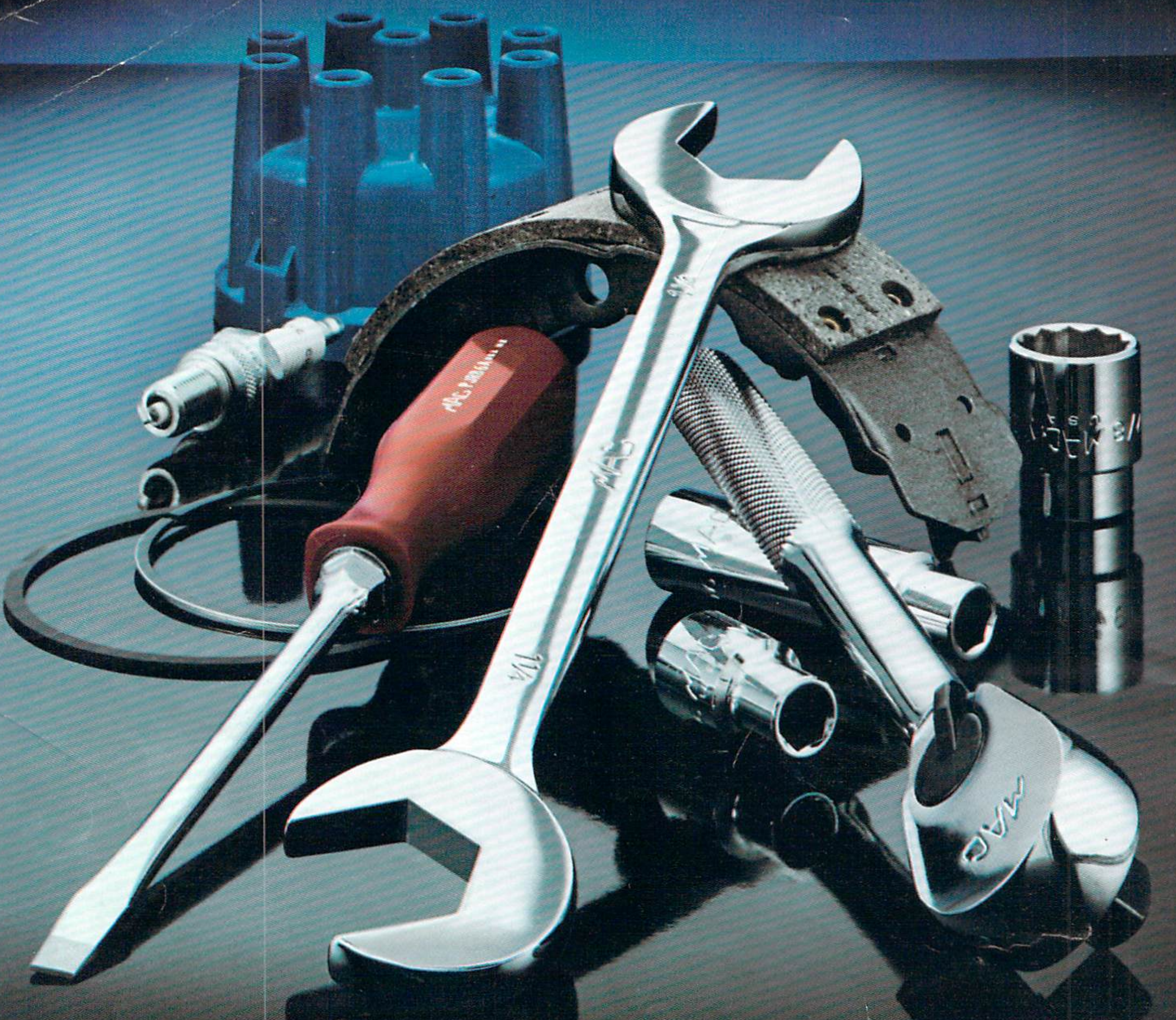

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Circle No. 1

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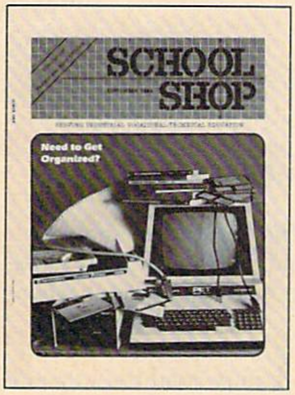
MAGAZINE

SEPTEMBER 1984, VOL. 44, NO. 2

SCHOOL SHOP

SERVING INDUSTRIAL VOCATIONAL-TECHNICAL EDUCATION



The "before" photo on the cover shows a typical arrangement of computer paraphernalia *without* one of the carts or stands featured in our "Organizing Your Computer Equipment" article collection. Turn to pages 18-25, build the unit of your choice, and take your own "after" shot of accessible and orderly equipment for computer-aided education! The annual Directory of Federal and State Officials starts on page 41. Equipment for cover photo courtesy of Mary Lowery and Klager Elementary School, Manchester, Michigan. Cover photo and design by Sharon K. Miller.

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Circle No. 4

School Shop Talk

The Battle Is On

NOW that the political conventions are over and the Democratic and Republican candidates are facing one another with just two months remaining before the election, the stance on education of each of the presidential as well as all congressional candidates requires our attention.

The party platforms tell part of the story, although they are not always adhered to by either the presidential candidates or those seeking congressional offices. The Republican platform was not available when this was written, but the Democratic platform has been adopted and calls for support for a strong educational system with increased federal support. It states, "No public investment is more important than the one we make in the minds, skills, and discipline of our people." It further calls for "the immediate restoration of the cuts in funding of educational programs by the Reagan Administration and for a major new commitment to education."

The Democratic platform also calls for a face-lift for vocational education and a federal commitment to a comprehensive jobs training program with cooperation with the private sector as well as between local, state, and federal agencies. It states that all agencies must work with the private sector for training that leads to jobs and must make a concerted effort to combat the high rates of unemployment among minority teenagers.

With respect to vocational education, the Democratic platform asserts that the field "should be overhauled to bring instructional materials, equipment, and staff up to date with the technology and practices of the workplace and target assistance to areas with large numbers of disadvantaged youth. We will insist that every child be afforded an equal opportunity to fulfill his or her potential."

The Democratic platform is more general than specific, emphasizing a more vigorous role by the federal government in aiding local and state agencies in providing a "partnership in excellence." To this end it states: "Recognizing that young people who are never given an opportunity for a job will be less likely to hold one in adulthood, we will also emphasize training and employment opportunities for youth. In so doing, we need to establish a genuine working partnership with the private sector."

What must be kept in mind, of course, is that the Congress, and not the president, passes legislation and makes appropriations. It is imperative, therefore, to let your congressional candidates know how you feel about educational legislation so that, hopefully, they will act accordingly.

Even though the Republican platform is not available at this time, the Reagan Administration's attitude toward minimizing federal participation in all educational activities is a matter of record. Budget cuts have been promoted in practically all educational programs, although Congress has not always gone along with them—vocational education being a notable example. The Democratic platform charges that the Administration has "dismantled virtually all of the successful programs to train and employ young people."

Earlier, the President tried to disband the Department of Education—but Congress balked and the department still exists, although on a greatly reduced budget, including the Division of Vocational and Adult Education. Reliable statistics on vocational education are no longer available from the Department of Education.

How education fares in the next four years depends on the complexion of the new Congress and the leadership of the President. Time will tell.—*L. W. P.*

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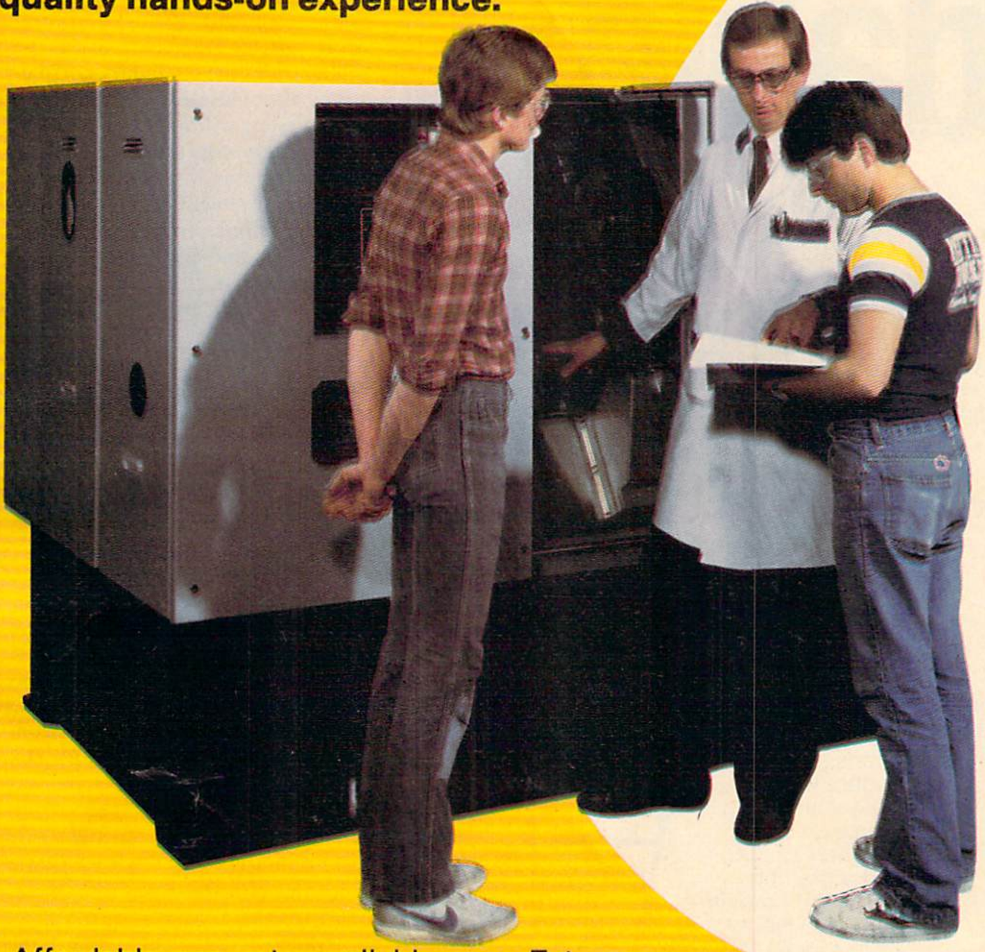

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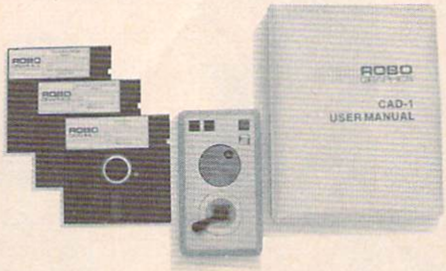

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Circle No. 6

News

NCRVE Sponsors Secondary Vo-Ed Commission

The National Center for Research in Vocational Education (NCRVE) at Ohio State University, Columbus, Ohio, is sponsoring a National Commission on Secondary Vocational Education with funding through the U.S. Department of Education, Office of Vocational and Adult Education. The commission aims to fill the gap left by other recent major educational commissions that have focused primarily on secondary students' academic objectives. While not ignoring the basics, the group will consider the secondary curriculum in terms of preparation for work.

The commission will also examine the need for secondary vocational education, student access to vo-ed, vo-ed's response to shifting job requirements and changing workplace conditions, and the coordination of vocational and academic preparation. The commission is composed of 13 representatives of education and industry from across the U.S.

For a schedule of hearings to be held across the country, contact the NCRVE, 1960 Kenny Rd., Columbus, OH 43210. The commission encourages interested individuals to submit testimony either at a hearing or directly to the NCRVE, to the attention of Dr. Linda Lotto.

Stanley Announces Furniture and Mass Production Awards

Several repeat winners appeared in the 1984 mass production contest sponsored by the American Industrial Arts Association and Stanley Tools division of The Stanley Works. In the grades 6-8 division, teams from Richmond (Michigan) K-8 Elementary School won grand prize and second prize. The school had taken second prize in last year's contest. In the same division, Poynette (Wisconsin) Middle School, winner of a third prize last year, took first prize.

In the grades 9-12 division, Rice Lake (Wisconsin) High School received grand prize, a repeat of the school's performance last year. In the college undergraduate division, the University of Wisconsin-Stout was also a repeat grand prize winner.

Other winners reflected the national scope of the contest. In the grades 6-8 division, third prize went to RHAM Junior High School, Hebron, Connecticut. First prize in grades 9-12 was won by Kewaskum (Wisconsin) High School, second prize by Central Linn High School, Halsey, Oregon, and third prize by Mapleton High School, Ashland, Ohio. In Stanley's college division, first prize went to students at Virginia Polytechnic Institute and State University, Blacksburg, second prize to Berry College in Mount Berry, Georgia, and third prize was taken by New Mexico

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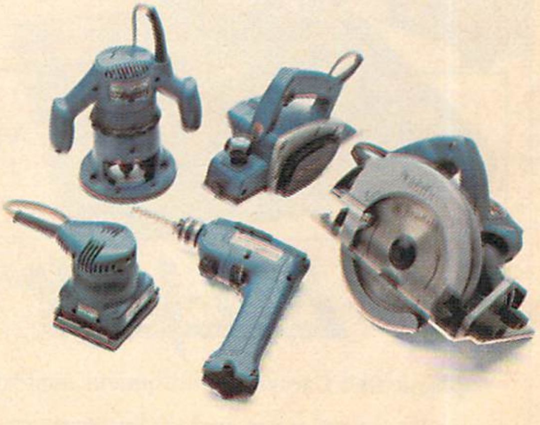

Highlands University, Las Vegas.

Thomas Wright of Ball State University, Muncie, Indiana, supervised a team of 10 judges in the mass production contest.

Students at Madison Central High School, Richmond, Kentucky, won five prizes in Stanley's 1984 national furniture contest. Stacy Rowlette won the $2,500 grand prize for his Queen Anne lowboy. Chris Curry won a $1,500 first prize for a drop-front secretary. Second prizes of $750 went to Thomas Masters and Danny Castle, and Franklin Revel won a $500 third prize.

First prizes also went to Michael Laken, Kittatinny Regional High School in Newton, New Jersey, for a Queen Anne secretary, and to Keith Yow, Chapel Hill (North Carolina) Senior High School, for a gun cabinet. James Troesch, Perry Central High School, Leopold, Indiana, received a second prize, and third prizes went to Tyler Meyer, Ludlow (Kentucky) High School, and James Sullivan, Bernards High School, Bernardsville, New Jersey.

Both the mass production and furniture contests are open to students nationwide. For more information, contact The Stanley Works, 195 Lake St., New Britain, CT 06050.

AIAA Elects Members of 1985-86 Board of Directors

Thomas A. Hughes, Jr., associate director of industrial arts education for the state of Virginia, has been elected 1985-86 president of the American Industrial Arts Association (AIAA). Hughes has earned a nationwide reputation as a curriculum innovator during 18 years as a state IA supervisor.

C. Daniel Miller, specialist for IA education for the state of Alabama is the new Region 2 director on the AIAA board of directors. His major responsibility is to communicate with state representatives in his region regarding membership, communications, and governmental activities of the association. Charles M. Burke, a teacher from Cheyenne, Wyo., has been elected Region 4 director. ☐

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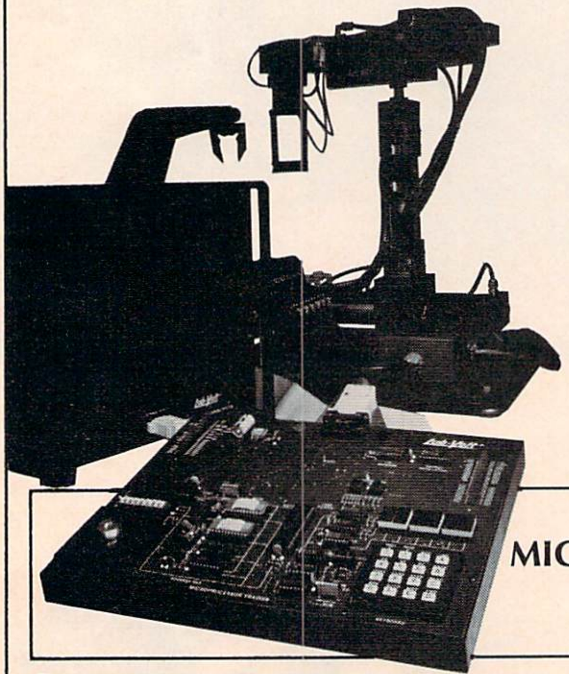

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Calendar

Fall Convention, Minnesota Industrial Arts Association, Holiday Inn, St. Cloud, Sept. 21-22.

Annual Conference, New England Industrial Arts Teacher Association, Ashworth Hotel and Hampton Beach Casino, Hampton Beach, N. H., Sept. 28-29.

Hands-on Screen Printing Seminar, Advance Process Supply Co., Chicago, Ill., Sept. 20-22. For information on seminars to be held throughout the year, contact Ms. Merrill Green, Advance Screen Printing Institute, 400 N. Noble St., Chicago, IL 60622.

Partnerships for Tomorrow's Jobs—The Future of the JTPA, National Alliance of Business, Atlanta, Ga., Sept. 23-25.

Public and Private Sector Linkages for Economic Development, National Center for Research in Vocational Education, Burlington, Vt., Sept. 25-26.

Four-State Conference (Kansas, Missouri, Arkansas, Oklahoma), Pittsburg (Kansas) State University, Oct. 5-6.

Fall Workshop/Conference, Illinois Technical Drafting Teachers Association, Continental Regency Hotel, Peoria, Oct. 18-20.

High Tech 84, Industrial Education Council of the Alberta Teachers' Association, Victoria Composite High School, Edmonton, Oct. 18-20.

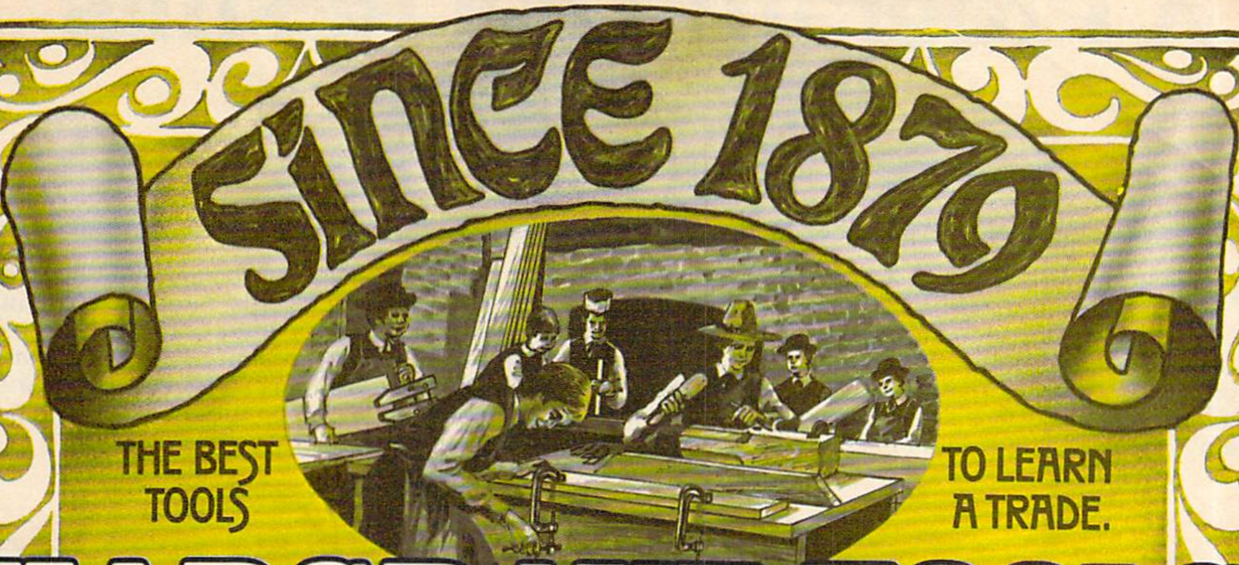
Annual Convention, Wisconsin Technology Education Association, South Hall, State Fair Park, Milwaukee, Oct. 24-25.

Fall Conference, Dept. of Industrial Arts and Technology, State University of New York College at Oswego, Oct. 25-26.

Technology Interface II, Ball State University, Muncie, Ind., Nov. 1.

Fall Meeting, Illinois Woodworking Teachers' Association, University Union, Illinois State University, Normal, Nov. 2.

Reliability Engineering & Management Institute, College of Engineering, University of Arizona & Motorola, Inc., Ramada Inn, Tucson, Nov. 26-30. ☐



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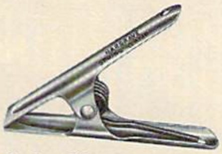
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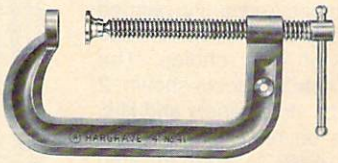

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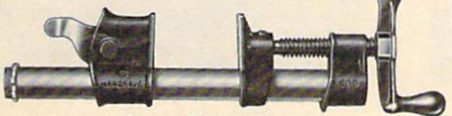
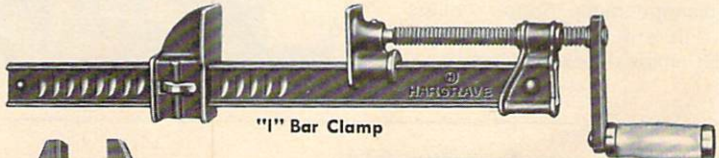

Clamp Fixture-Pipe



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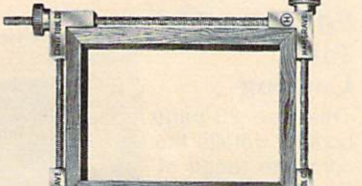
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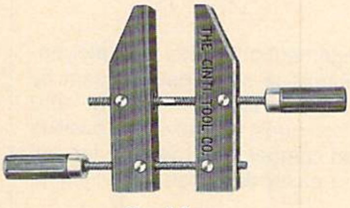
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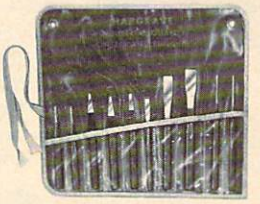
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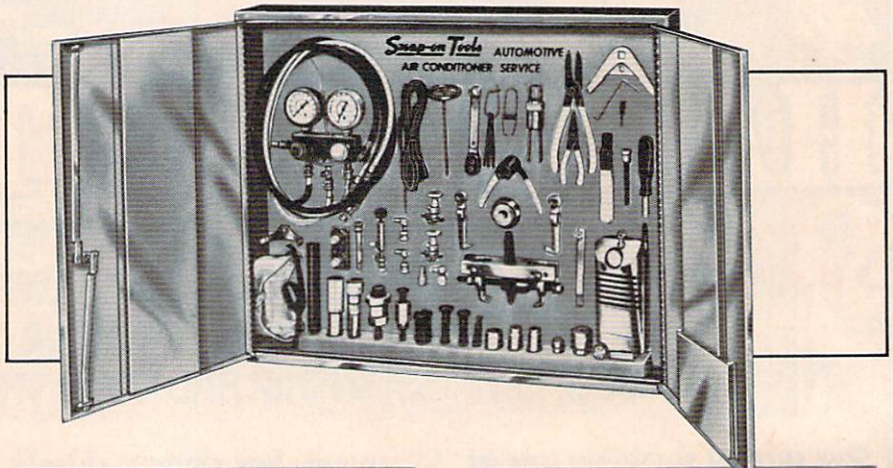

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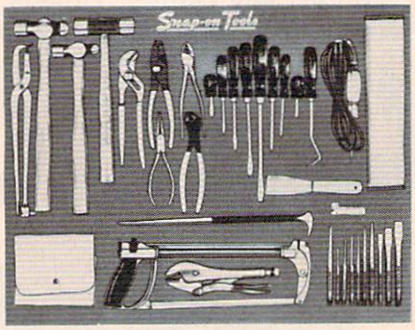

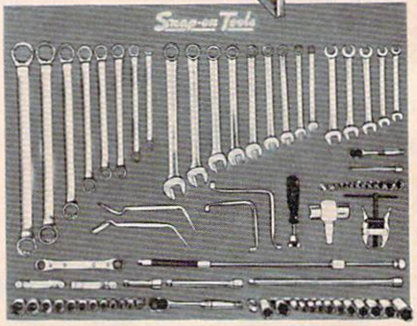

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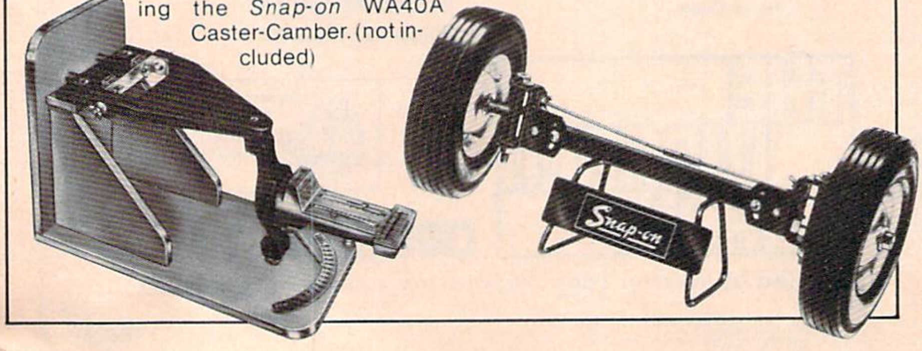

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564

Learning Resources

For further information about the materials listed below, circle the number on the reader service card in this issue. (P = paper, L = list price, S = school price, SG = student guide, and TG = teacher guide.)

PRINT MATERIALS

Robotics Programs

William Ashley, Robert Abram, Edward Konopka, & Lloyd R. Carrico
National Center for Research in Vocational Education, 1983
57 pages
$5.75 P

This book gives suggestions for planning and developing postsecondary courses and programs in robotics technology. The authors forecast trends in the robotics industry and provide guidelines for supplies planning, curriculum specifications, technical competencies, equipment, and staff requirements. They also list additional helpful publications, robot manufacturers, and existing postsecondary robotics programs.

Circle No. 250

Japanese Woodworking Tools: Their Tradition, Spirit, and Use

Toshio Odate
The Taunton Press, 1984
189 pages
$22.95

Written by a woodworker and teacher trained in his native Japan, this book provides an introduction to Japanese woodworking tools, which are now available in many American stores and mail-order catalogs. The author covers both use and maintenance of every type of tool, from saws and planes to marking and sharpening tools. He also gives insight into the techniques and philosophy of traditional Japanese woodworkers.

Circle No. 251

Automotive Emission Control and Computer Systems

Don Knowles
Reston Publishing Co., Inc./ Prentice-Hall Co., 1984
295 pages
$19.95 P

This book explains the operation of most domestic automotive emissions and computer systems and outlines the ways various components contribute to meeting emission and corporate average fuel economy (CAFE) regulations. The author places special emphasis on the service and diagnosis of expensive electronic components.

Easy-to-follow charts simplify diagnostic procedures, which most often require basic test equipment such as the voltmeter and ohmmeter. Scope pattern diagnosis of the electronic ignition system and scope testing of modules and pickup coils are explained.

The author details electronic voice alert systems, digital instrument panels, and travel computers. He also includes diesel emission levels and emission control devices, and some emission and computer systems on imported cars.

Circle No. 252

Getting the Most from Your Micro

Ernest E. Mau
Hayden Book Co., Inc., 1983
273 pages
$14.95 P

Covering the computer, printer, and disk drive, this book details all aspects of microcomputer care. The author provides step-by-step preventive maintenance and procedures to correct malfunctions in any size microcomputer system. An annotated product guide gives names and addresses of producers and distributers of computer maintenance items.

Circle No. 253

Stripping: The Assembly of Film Images

Harold L. Peck
Graphic Arts Technical Foundation, 1984
298 pages
$21 GATF members, $42 nonmembers; P

This book is intended as an authoritative reference on the assembly of film images

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for printing. Topics covered include facilities, equipment, and tools; materials and supplies; planning; imposition considerations; image register systems; film assembly basics; assembly for single-color and multicolor printing and multiple imaging of plates; checking, proofing, and correcting; and automated image/film assembly.

The author provides a 15-page glossary of terms.

Circle No. 254

Metalworking for Jewelry: Tools, Materials, Techniques

Tim McCreight
Van Nostrand Reinhold Co., 1983
160 pages
$11.50 P

Written by a metalworking instructor, this book covers the metals, tools, and casting and forming techniques used in jewelry making. The author includes numerous photos showing sample work by professional metalworkers and his own students. He gives advice on purchasing metal and stones and provides a list of suppliers.

Circle No. 255

Power Trains—Compact Equipment

Deere & Co., 1983
156 pages
$8 L, $6.40 S; P

Covering gas and diesel equipment rated up to 40 hp, this manual details power trains found on chain saws, lawn mowers, lawn and garden tractors, compact utility tractors, skid-steer loaders, rotary tillers, and snow blowers. The text includes operating procedures and maintenance/repair of belt, chain, gear drives, clutches, transmissions, differentials, final drives, and power take-offs.

The appendix gives definitions of important terms and a list of suggested readings.

Circle No. 256

Welding: Fundamentals and Procedures

Jerry Galyen, Garry Sear, & Charles A. Tuttle
John Wiley & Sons, Inc., 1984
273 pages
$18.95

Appropriate for welding students at apprentice through journeyman levels, this text aims to provide working knowledge of electric and gas welding and cutting processes used in industry. Basic topics covered include SMAW, GTAW, and GMAW, blueprint reading, inspection and testing, terminology, and an introduction to metallurgy.

All dimensions are in metric with conversions into U.S. customary units given in parentheses. The authors emphasize safety throughout.

Circle No. 257

Mother's 101 Workshop Projects

The Mother Earth News, Inc., 1984
207 pages
$14.95 P

Written by the editors of *The Mother Earth News* magazine, this book offers plans, illustrations, and construction procedures for 101 wood, electricity, and metal projects. Included are home, garden, and shop furniture and tools; toys and games for children and adults; arts and crafts projects; energy-saving projects; and five "money-making" projects that instructors could use for mass-production experience or fund raisers. The book also includes a chapter on welding basics and instructions and plans for building a welding table.

Color and black-and-white photos and drawings appear throughout the text. Brick House Publishing Co., Inc., distributes the book.

Circle No. 258

Machinery's Handbook, 22nd Ed.

Frank Oberg, Franklin D. Jones, & Holbrook L. Horton
Industrial Press, Inc., 1984
2,512 pages
$45

This reference provides ready-to-use data on all aspects of mechanical parts and products in the form of standards, definitions, formulas, illustrations, graphs, and tables. Individual sections include coverage of math, mechanics, strength of materials, balancing, plain and antifriction

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bearings, springs, shafting, keys and keyseats, and belting. This edition increases coverage of metric standards, emphasizes the most widely used elements in metalworking industries in both metric and inch dimensions, and gives worked-out examples that illustrate the application of formulas to calculator or computer use. New tables and charts provide working data for immediate use.

Circle No. 259

Mathematics for Electricity and Electronics

Gene Waring
Delmar Publishing Inc., 1984
672 pages
$22 L, $16.50 S; T.G. $7.25

Designed to provide students with the mathematics background necessary for successful study of electricity, this text intersperses chapters on math with chapters on electrical theory. The author cites as primary goals (1) providing the basic electrical theory required by the electricity industry, (2) providing math fundamentals needed to solve electrical problems at the technician level, and (3) developing each electrical and math concept from basic principals through complex applications. Special emphasis is given to circuit analysis.

The author includes objectives, solved examples, and exercises in each chapter.

Circle No. 260

SOFTWARE

Teach Yourself Apple BASIC

Addison-Wesley Publishing Co.
Single-density 5-1/4" disk, 192-page book
$34.95

According to the producer, this package will teach students to understand and use BASIC in four hours. Coverage includes turning on the computer, activating the disk, and starting a program. The program has questions and immediate answers, quizzes, and games. The book reinforces concepts presented through the software, serves as a reference, and offers tips for further study. The book can be purchased separately.

Circle No. 261

TestRite

Class 1 Systems
Diskette and book
$139

Suitable in middle elementary through postsecondary settings, this curriculum management software stores test items and generates customized tests. Items from any subject area can be entered, edited, selected, and printed as in-class tests and study guides. Whole files, portions of files, or selected questions can be used to print a single test. Instructors can create large tests and exams from multiple files by merging their questions with the program's facilities. Every question can be printed in any of four formats: multiple choice, true-false, matching, and completion. Numbering options, customized titles, and user-edited test-taking instructions increase the program's flexibility.

The package is compatible with Apple II or IIe and TRS-80 III or IV.

Circle No. 262

Briggs & Stratton Engine Model Number and Overhaul Specifications

Hobar Publications
$29.50

This software provides instruction concerning model numbers, basic engine torque, tune-up specifications, and reject sizes. Graphics are included.

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Touch Technologies
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This software package assists teachers with writing lessons on the computer for any subject. The software is available for Apple II+ and IIe; the IBM PC, XT, and PCjr; the Acorn; and the Commodore 64.

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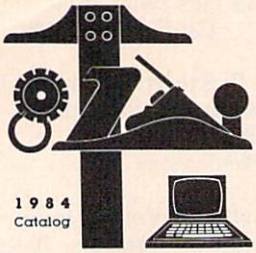

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Circle No. 14

Shop Kinks

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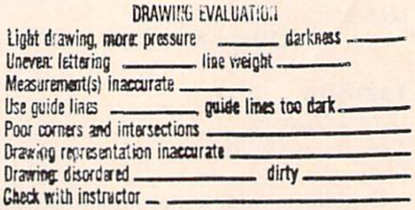
For fast, thorough grading of students' drafting work, have an inexpensive self-inking stamp that lists your grading criteria made to order. Stamp each drawing before grading and check errors quickly on your criteria list. This technique reduces grading time while increasing students' understanding of each drawing's deficiencies.—**J. Pat Spicer**, Western Illinois University, Macomb.



DRAWING EVALUATION
Light drawing, more pressure ______ darkness ______
Uneven: lettering ______ line weight ______
Measurement(s) inaccurate ______
Use guide lines ______ guide lines too dark ______
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Drawing representation inaccurate ______
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Another Role for Erasers

Blackboard erasers make excellent applicators for rubbing rotten stone and oil or pumice and water on a urethane-finished or varnished surface. Keep in mind, though, that the eraser does not work for blackboard use after being employed in this way.—**Donald F. Kinnaman**, Alhambra High School, Phoenix, Arizona.

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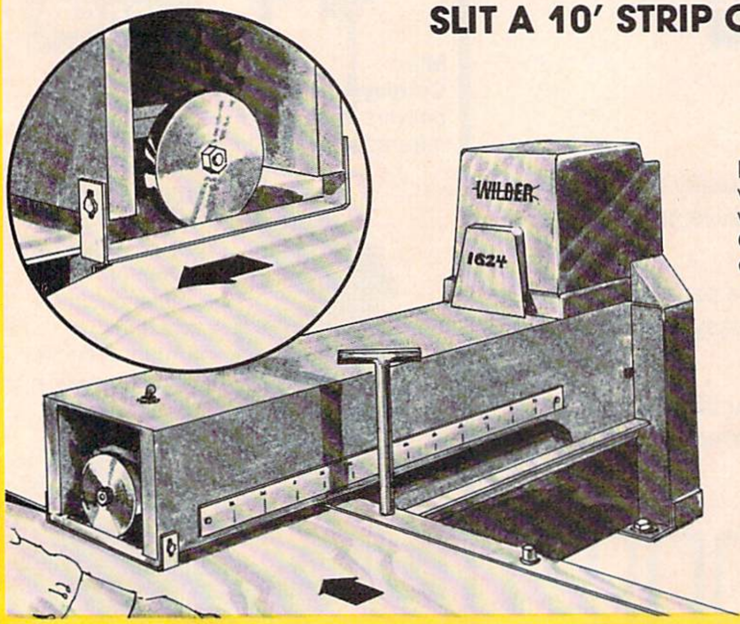

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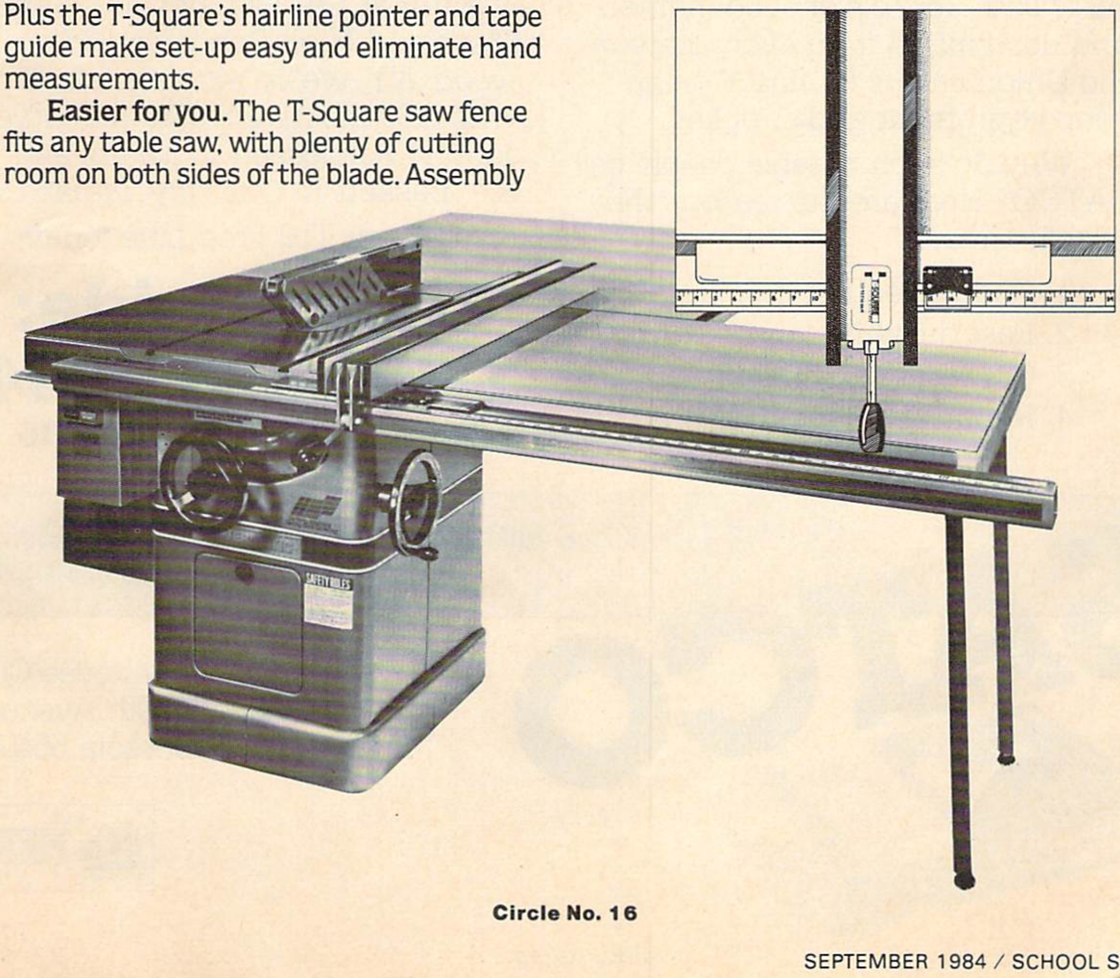

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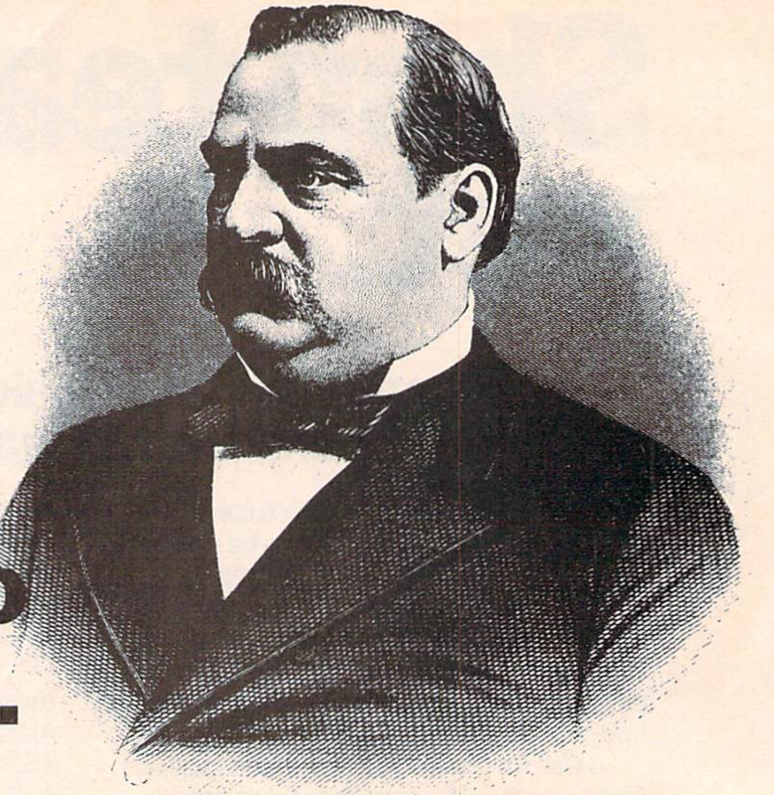

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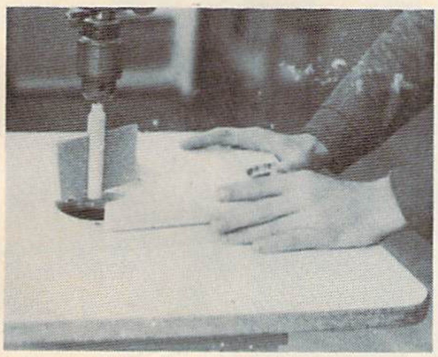
Try it—a big clock sure beats a tick-tack-toe board. In this case, bigger really is better!—**Dale E. Podojil**, Nordonia Hills High School, Macedonia, Ohio.

Glass Substitute

In the production of plaster molds and other shop work, you can eliminate the risks of broken glass and sharp edges by substituting tough plastic slabs. The slabs remain uniform in size, clean easily, and store neatly.—**Alan Becker** and **Samuel R. Rubinstein**, Stuyvesant High School, New York, New York.

Jiffy Sanding Drum

You can easily make an inexpensive sanding drum for irregular shapes and radii using a dowel and sandpaper. Begin by cutting a dowel to about 6″ length. Round one end down to fit into your drill-press or hand drill and cut a 1/16″ slit in the other end. Mount the dowel in the drill press and insert folded sandpaper. Adjust the drill press and sand.—**Lou DiLullo**, Delaware Valley Regional Center, Frenchtown, New Jersey.



Vise and Metal Protection

Remove the gauntlet portions from old welding gloves and cut them into 3″ × 3″ pieces. Place these pieces of leather on the vise jaws or around material to be cut or filed to prevent unsightly marks on your finished product.—**Kenneth Heitz**, Bradley-Bourbonnais Community High School, Bradley, Illinois.

Small-Projects Gluing Aid

Kitchen counter top cutouts work well as a gluing surface because they are very flat and easy to clean. Drill a hole through the cutout for convenient storage by hanging under woodworking benches. Many cabinet shops give the cutouts to schools free of charge.—**Wm. Paul Anderson**, Mt. Morris (Illinois) High School. ☐

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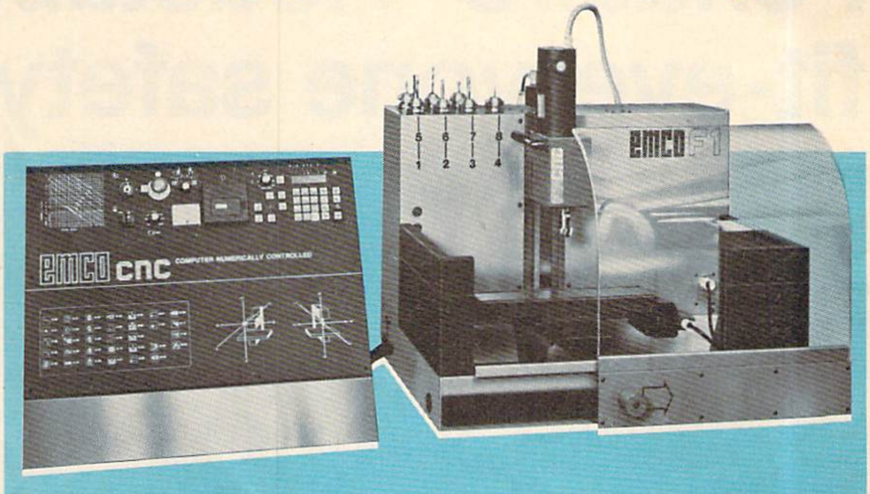

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Safety Is No Accident

By Kenneth Wilson, Jr.

AS an industrial arts technology teacher, you hold a very important responsibility—the safety of your students. Instructors who are overworked, teach large classes, or have rebellious students might ask, "Why bother? Why fix a guard on a machine? Who cares if the lumber is stacked haphazardly? What's the difference if some students miss safety instruction?" In most cases, however, they do bother—they care. They sincerely acknowledge their moral and ethical responsibility to their students, as well as the laws, policies, and regulations requiring a safety program. It is essential that they do.

The loss of sight or a finger, or injury to any other part of the body, is traumatic for all concerned and can be avoided through a good safety program.

For example, in Virginia the law requires that all occupants of your lab, including visitors, wear eye safety devices when a hazardous activity takes place. The instructor can be charged with negligence if someone is injured because of inadequate safety instruction or unsafe working conditions. Needless to say, a charge of this kind could be a painful experience and avoiding it should be a high priority.

What instructors can do. The loss of sight or a finger, or injury to any other part of the body, is traumatic for all concerned and can be avoided through a good safety program. Since most activities in the technology lab carry a certain risk or threat to the safety of students, teachers, and guests, a sound, well-organized safety program is a necessity.

Safety instruction in industrial arts technology aims primarily to:

- develop attitudes of respect and appreciation for working in a safe environment,
- create safety consciousness,
- foster safe work practices, and
- provide meaningful experiences to promote safety awareness.

Most law suits against industrial arts teachers involve negligence, defined in a dictionary as "the failure to use a reasonable amount of care resulting in injury to another." How can you protect yourself? The following steps assure your safety program validity:

- Make safety an integral part of daily lesson plans.

Since most activities in the technology lab carry a risk or threat to the safety of students, teachers, and guests, a sound safety program is a necessity.

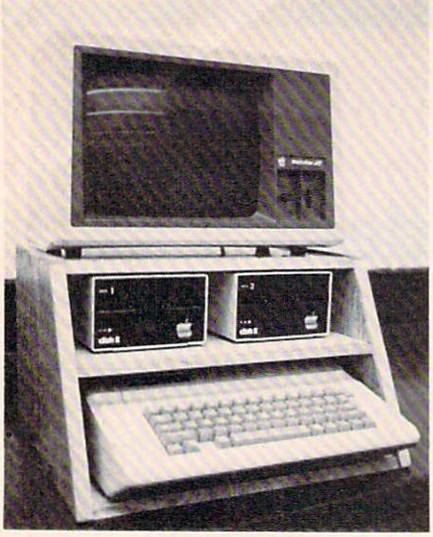
- For each safety session, give students a lesson plan to include in their notebooks. Student notebooks are valuable defense documents.
- Require that students keep a safety section in their notebooks to include all safety tests given.
- Maintain an accurate daily attendance record. If a student misses a safety discussion, make sure he or she is briefed on material that was covered.
- If a student misses a safety demonstration or test, require completion of appropriate make-up work before performing lab or machinery operations.
- Require parents'/guardians' signatures on all safety tests before allowing a student to work in the lab or operate machinery.
- Since most accidents involve machines, make sure that all machinery has guards in place and is in proper working condition. Remove from use machinery that does not meet these standards.
- Take time to check all equipment and keep up-to-date maintenance data on each machine. As a side benefit, this data will also aid in planning budgets for replacement.
- Fill out a report immediately if a student has an accident, and enter the accident on the machinery repair log. This protects the instructor and helps maintain accurate data for insurance purposes. Forward a copy of the report to your safety director.

You can further enrich your safety program with the following:

- Use commercially produced safety films and slides to supplement your lectures.
- Have each student design his or her own safety poster.
- Invite the school system safety director and attorney to speak to your class.
- Provide each student with a personal pair of safety glasses and be sure they—and other safety equipment—are worn whenever students perform hazardous activities.
- Be a model. Always set proper safety examples for your students.

Safety consciousness is an asset to each student in your lab, at home, and in a work environment. The familiar "Murphy's Law" says, "If anything can go wrong, it will." With a good, sound, tested safety program in operation in your lab, Murphy's Law will have no validity. Remember, safety is no accident. □

Kenneth Wilson, Jr., is industrial arts education program specialist, Fairfax (Virginia) County Public Schools.



Organizing Your Computer Equipment

Desk Top Computer Stand Helps Save Table Space

By Ronald R. Murphy

DEVELOPED by students and staff in Washington State University's industrial technology program, this inexpensive desk top computer stand stimulates student enthusiasm. Acceptance of the stand for school and home use has been outstanding. Parts can be easily mass produced and readily finished and assembled.

During the design phase of the stand, college students researched products on the market designed to present the microcomputer, disk drive(s), and monitor for easy access by the user. The primary computer used during the design phase was an Apple IIe®, however, other microcomputers were measured for compatibility.

Users were asked what problems they had encountered with desk top furniture products currently available. The major problems were:

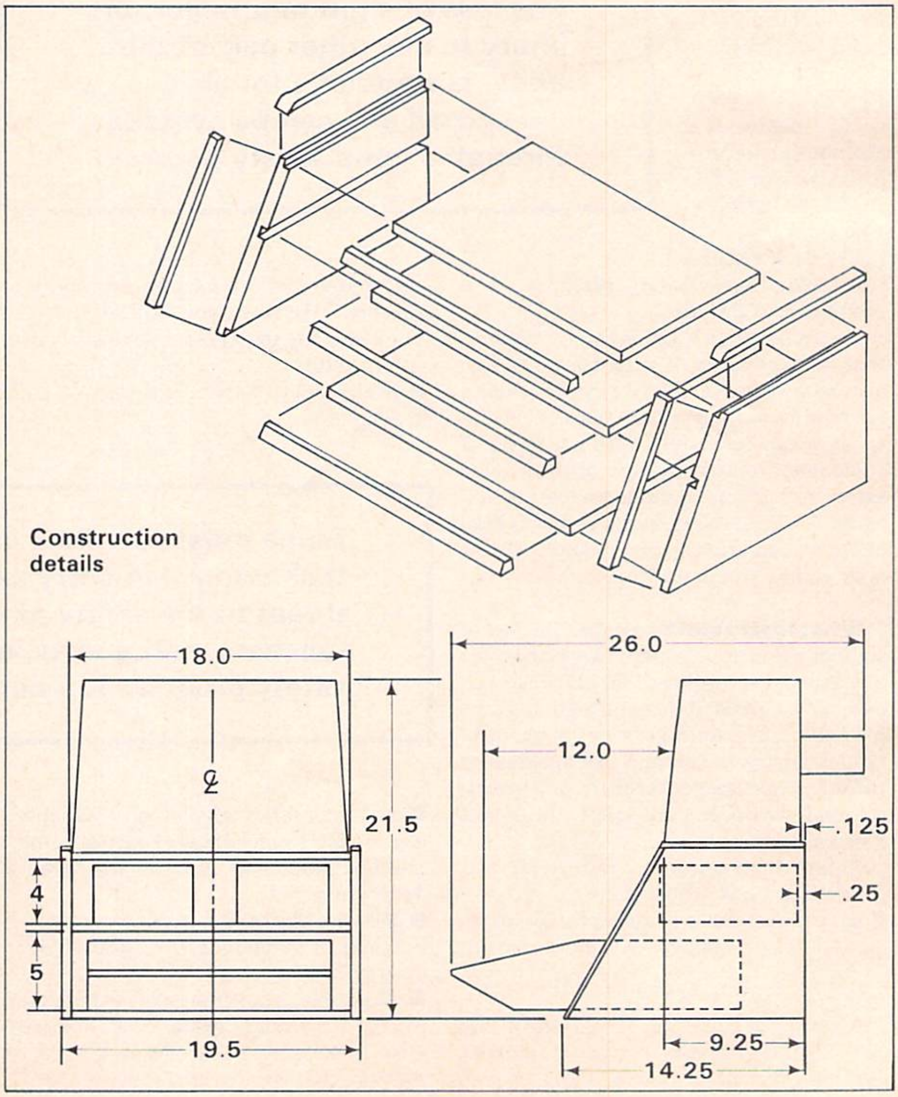
- the short distance from the keyboard to the monitor (approximately 5″ from the center of the keyboard to the monitor face),
- the limited access to the internal components of the computer for plugging in additional elements or troubleshooting, and
- the height of the monitor screen in relation to the user's position.

The researchers designed the desk top computer stand to allow 12″ from the center of the keyboard to the front of the monitor, position the disk drive or drives on a center removable shelf for easy access, and permit tilting the monitor downward from the top shelf, eliminating user neck strain. The desk or counter height found to be most desirable for adult users was 26″ from the floor.

The illustrations and photograph will enable industrial arts teachers to include this product in their repertoire of ideas for manufacture. For our model, we made the shelves from 1/2″ Cortron, a particle board with a laminated plastic film surface. The center shelf slides out for easier access to components; the disk drives can be anchored to the shelf. The side standards are 3/4″ oak veneer; we used bullnose facing of oak on exposed edges to give the stand a furniture appearance.

The stand was designed so it could be attached to a table. Commercial anchor devices to protect the computer system from theft, such as Anchor Pad, are available from office furniture or microprocessor distributors.

Marketing and sales promotion of products such as computer stands can be enhanced by use of brochures. Descriptive illustrations, special features, and product usage information are helpful in persuading potential customers to buy your new product. □



Construction details

Ronald R. Murphy is an assistant professor, Department of Vocational and Technical Education, Washington State University, Pullman.

Organizing Your Computer Equipment

Table with Lockable Cover Can Protect Components

By Howard Matthews

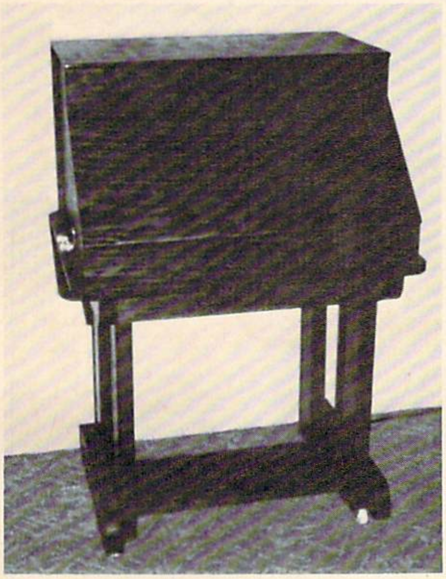


Table with cover in place

THIS computer table was designed to be used with an Apple IIe or similar-size computer. It is constructed from 2 × 4s, shelving boards, and plywood and has a lockable cover to prevent unauthorized use or vandalism. The dimensions of the table may be changed to accommodate books, a printer, second disk drive, or other items.

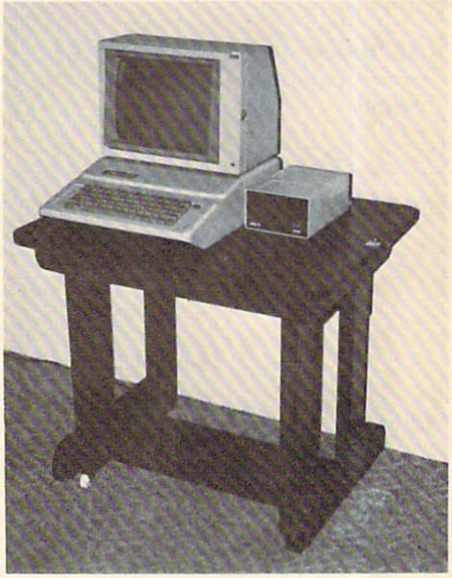
Procedure

1. Cut the 2 × 4s to length, rounding the corners with a jig saw, and sand. Assemble according to the plans using 8d finishing nails and carpenter's glue.

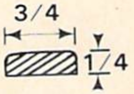
2. Notch the bottom 2 × 4s to take the 3/4" thick bottom brace, installed from the bottom so as not to decrease the leg room. Install the top front and rear 3/4" braces

---

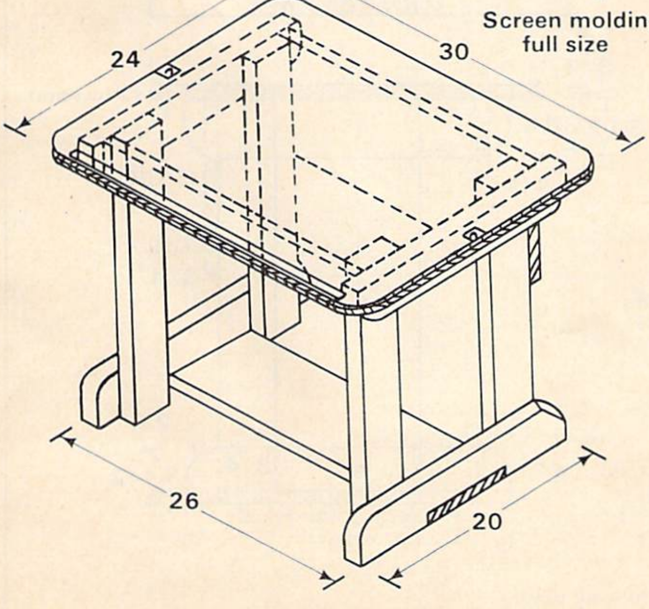
Howard Matthews is a wood technology and electricity/electronics instructor, Hampton (Virginia) High School.



Table, set up and ready to use



Screen molding, full size



Isometric view of completed table

Bill of Materials

Cover		
1	Top	1/2" × 15" × 28"
1	Back	1/2" × 16" × 28"
1	Top front panel	1/2" × 3-1/2" × 28"
1	Bottom front panel	1/2" × 4" × 28"
1	Inclined panel	1/2" × 13-1/4" × 28"
2	Ends	1/2" × 16" × 28"
2	Hasps	1" × 2-1/2"
Table		
1	Top	3/4" × 24" × 30"
4	Legs	2" × 4" × 25"
4	Side braces	2" × 4" × 20"
1	Front brace	3/4" × 3-1/4" × 23"
1	Rear brace	3/4" × 9-1/4" × 23"
1	Bottom brace	3/4" × 8-3/4" × 26"

Casters to suit
Finishing nails—4d, 6d, 8d
Carpenter's glue
Stain, paint, or other finish

using glue and 6d finishing nails.

3. After shaping and sanding, attach the plywood top with glue and 6d finishing nails.

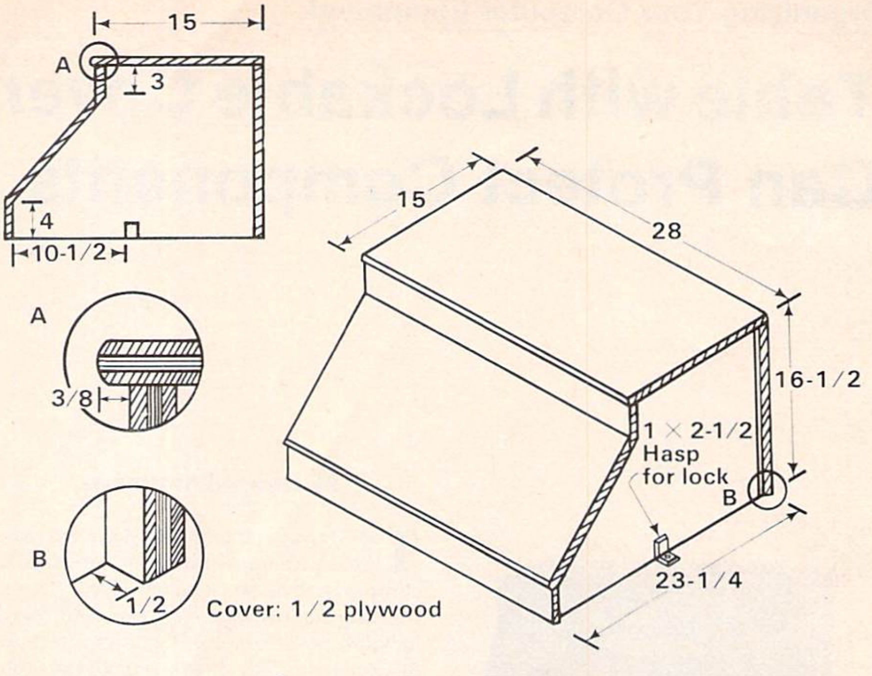
4. Cut the plywood cover parts to size, using angles where necessary for proper fit. Use 4d finishing nails for assembly. The ends of the cover are recessed 1/2". The hasps are bent at a 90° angle to fit flush with the table top.

5. Use a nail set to sink all nails below the surface and cover with plastic wood that matches the color of the stain to be used.

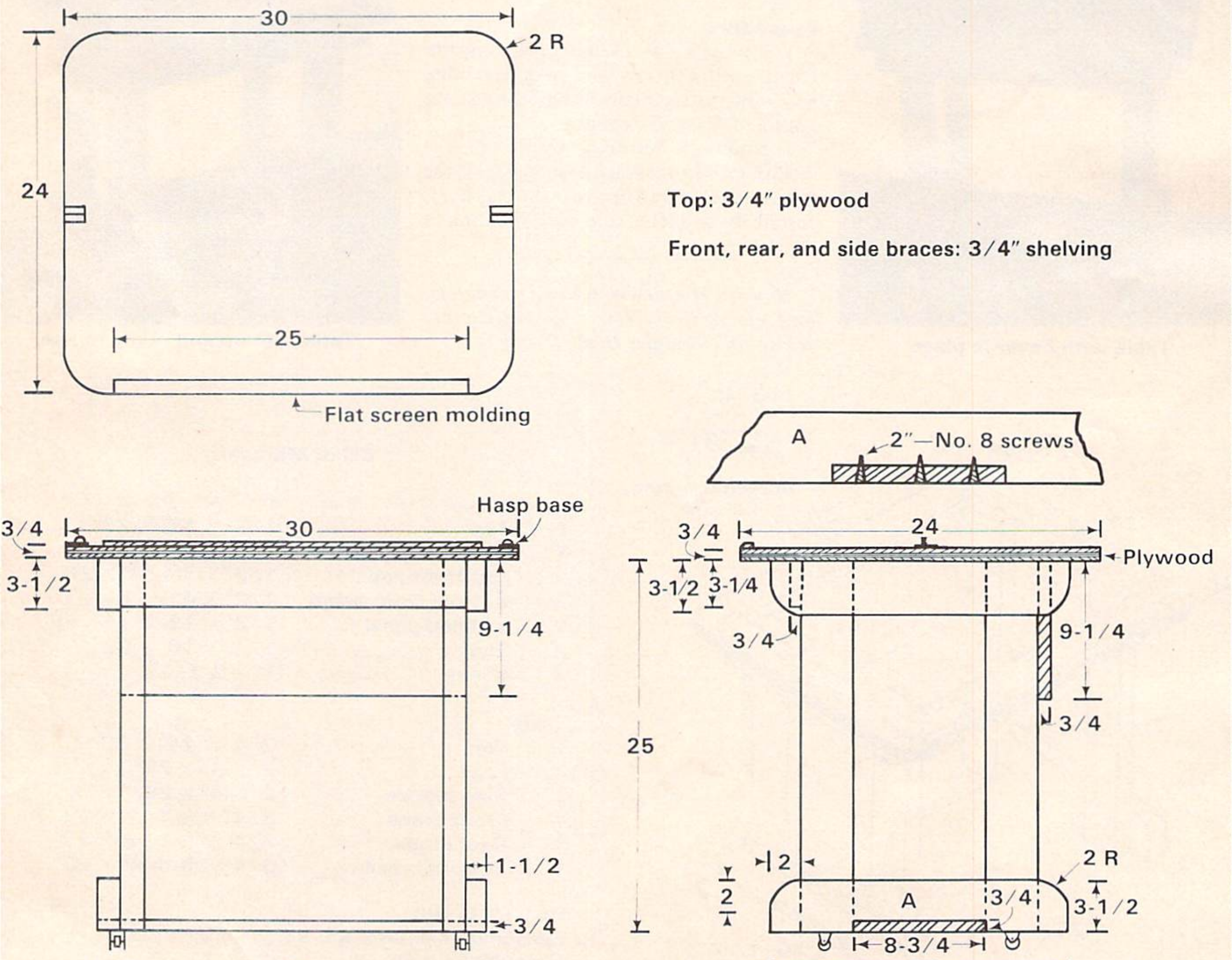
6. Attach suitable casters to the bottom of the table for mobility.

7. Stain, paint, enamel, or any other finish may be used. ☐

See page 22 for a description of two more computer units built with wood.


15
A
3
4
10-1/2
A
3/8
B
1/2
Cover: 1/2 plywood
15
28
16-1/2
1 × 2-1/2
Hasp
for lock
B
23-1/4

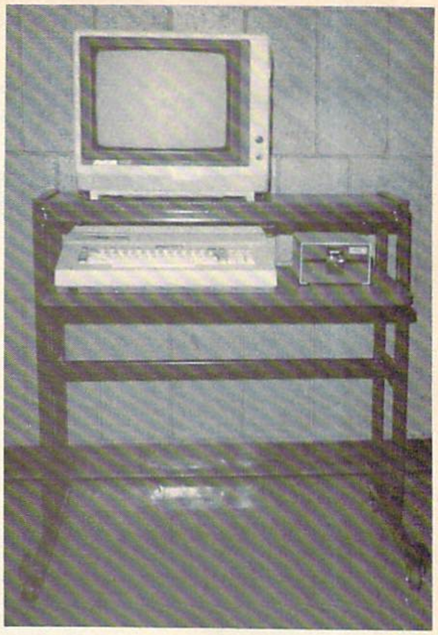
Cover construction details


30
2 R
24
25
Flat screen molding
Top: 3/4" plywood
Front, rear, and side braces: 3/4" shelving
Hasp base
3/4
30
3-1/2
9-1/4
1-1/2
3/4
26
A
2"—No. 8 screws
3/4
24
Plywood
3-1/2
3-1/4
3/4
9-1/4
3/4
25
2
2 R
2
A
3/4
3-1/2
8-3/4
20

Top, front, and right side views

Organizing Your Computer Equipment

Sturdy Metal Table Is Inexpensive to Build



By David Less

REALIZING the increased importance of computers, our industrial education department had been trying to get one. The industrial education club's moneymaking projects fell short of the goal. However, we discovered that our school district was considering the purchase of 14 computer tables for use in the elementary schools, expected to cost about $160 each. We proposed to build the computer tables in exchange for help in our "computer quest." The administration exceeded our hopes by offering a complete Apple system in exchange for building the tables. They also offered to buy the materials.

All teachers in all areas of our department agreed to donate time to the project. We divided the planning and construction responsibilities and everyone contributed ideas toward the design. The drafting teachers developed the plans. Since we anticipated that more tables would be needed in the future, we developed jigs and fixtures when applicable. We used 1" square tubing for the frame since it produced a sturdy table and was easy to work with. To eliminate the need to chip and clean welds, we used a MIG welder.

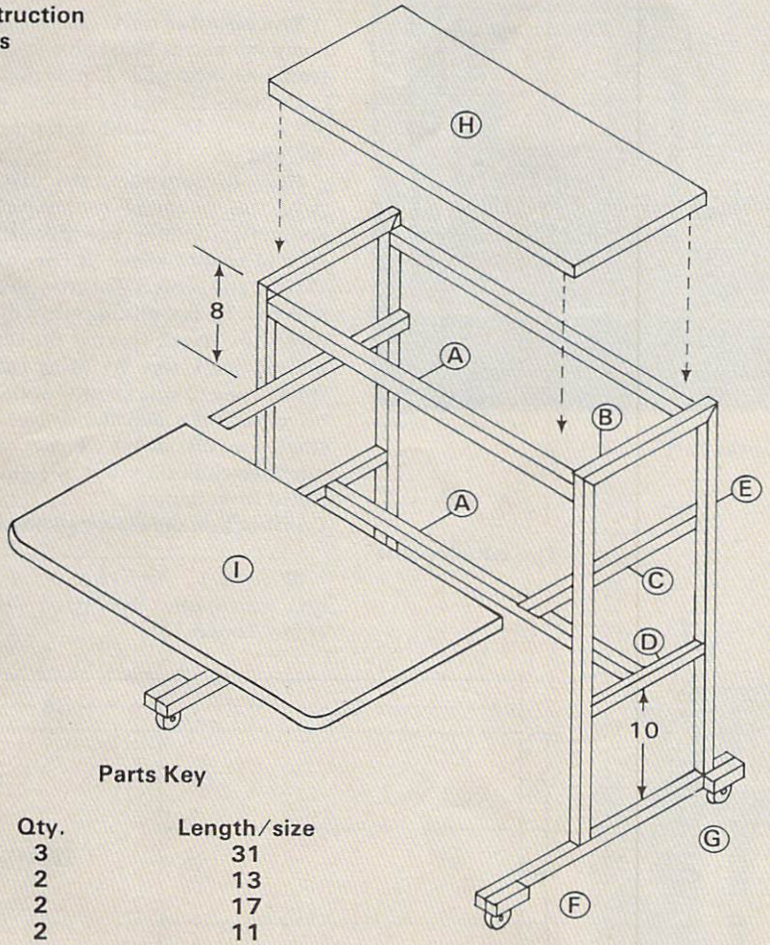
Sink cutouts, obtained from a local countertop shop for $1 each, were the right size for an Apple computer with two disk drives, leaving ample desk space for books and papers. The edges of the cutouts were sanded and painted the same dark brown as the metal frame.

Two-inch casters were welded on the bottom to provide mobility. Slots were plunge cut from underneath the top shelf to accommodate straps to secure the monitor. The shelf and table were each secured by four #10 × 1-1/2" sheet-metal screws. The height of the shelf and table was determined by experimenting with the comfort level of several different size people. Cost of the materials was $27.14 per table.

If we receive more orders for tables, we intend to set up a student mass production or group project to fill them. Since our school district is introducing computer usage as a junior high industrial education course, using the computer in our high school classes will be a natural progression to apply this background in a setting similar to industry. ☐

David Less is an electricity/electronics instructor, Hempstead High School, Dubuque, Iowa.

Construction details



Parts Key

Letter	Qty.	Length/size
A	3	31
B	2	13
C	2	17
D	2	11
E	4	30
F	2	24
G	4	3
H	1	3/4 × 13-1/4 × 30-7/8
I	1	3/4 × 19-5/8 × 30-7/8
	4	2" casters

Drawing by T. J. Foster

Bill of Materials

30'	1" square tubing
4	2" swivel casters
2	32" Formica sink cutouts
1	72" cargo strap
8	#10 × 1-1/2" sheet-metal screws
1	12 oz. can spray primer
1	12 oz. can spray paint

Organizing Your Computer Equipment

Easy-to-Build Plywood Carts Make Moving Equipment Easier

By Richard C. Anderson

MANY schools now have at least one computer setup and need two. Transporting and sharing a computer with several component parts can be a real hassle, in some cases deterring a teacher from using the computer. These carts provide a means of getting more mileage out of your school's computer and make transporting it and the peripherals easier.

The smaller cart. One big plus of this computer cart is being able to construct it from one sheet of 1/2″ plywood. The cart costs under $50 and is compact, measuring 37″ × 16″ × 34″. To move it, simply lift one end and go.

Easy to construct, the cart provides space for a complete computer setup: computer, monitor, two disk drives, printer, and printer paper. It has two drawers to store and protect diskettes plus space for reference books, putting everything at your fingertips. Work space is provided with a pull-out desk top. By using cable wiring which runs to one central outlet, the cart offers neatness and the convenience of a single on/off switch. Power cords and interface cables are out of sight and protected from damage.

Construction details are given on page 24.

Richard C. Anderson is an industrial arts instructor, Darlington (Wisconsin) High School.

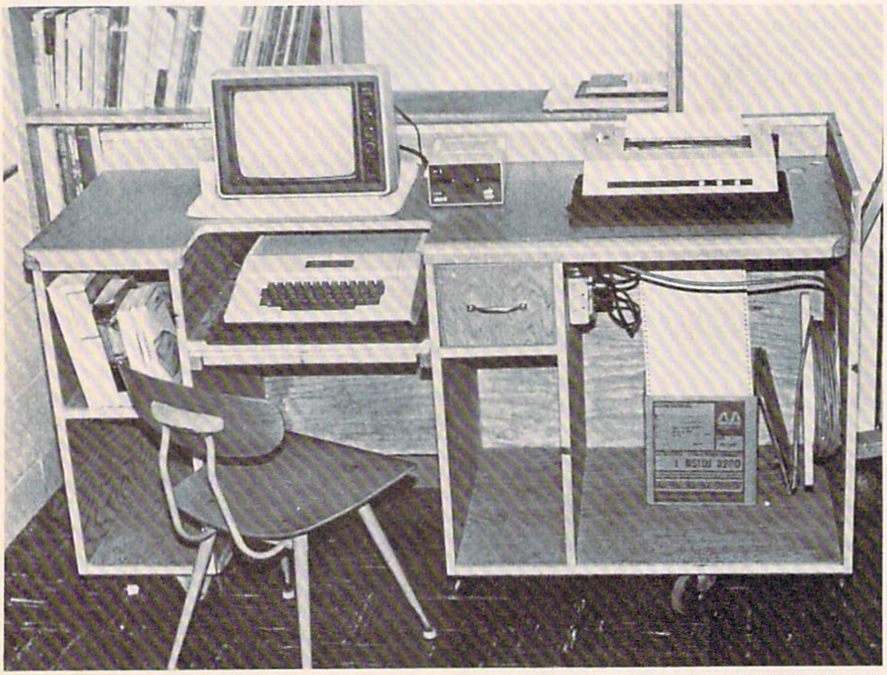
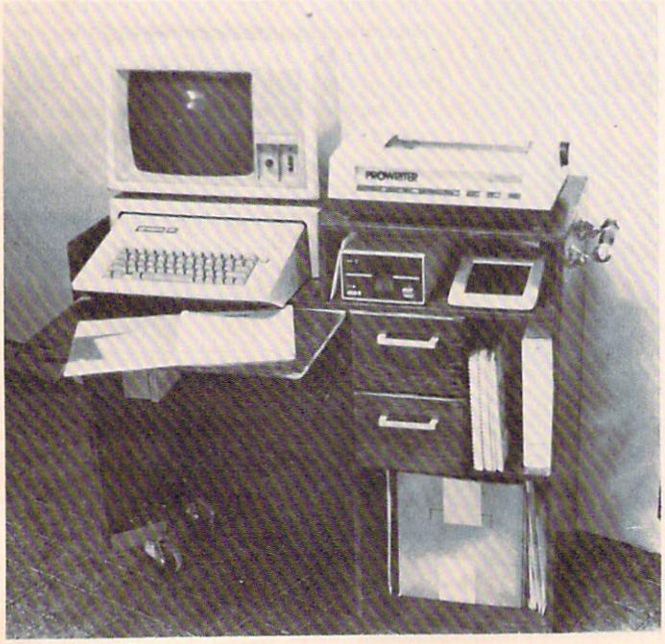
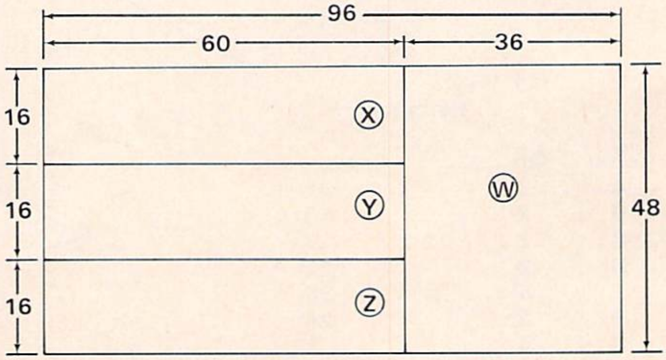


Photo by J. Rassman

The larger computer cart



The smaller cart



Material: 1/2″ G2S plywood

Fig. 1—Major cuts

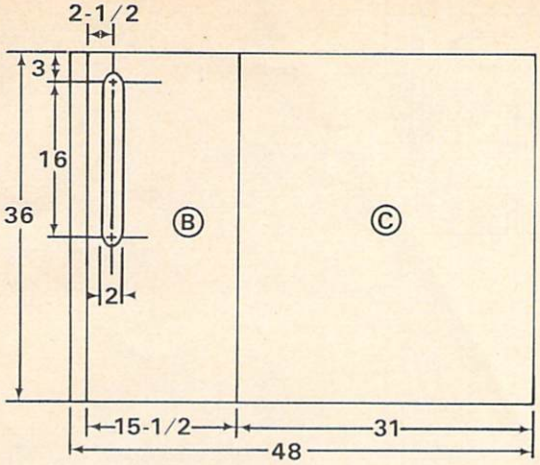

2-1/2
3
16
36
2
B
C
15-1/2
31
48

Fig. 2—Section W

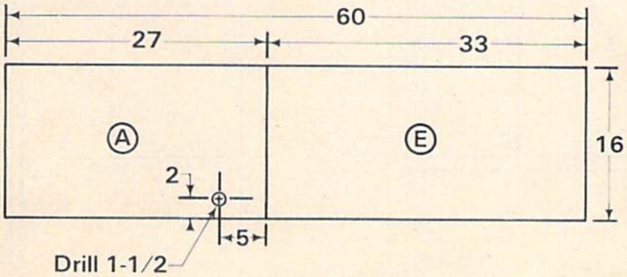

60
27
33
A
E
16
2
5
Drill 1-1/2

Fig. 3—Section X

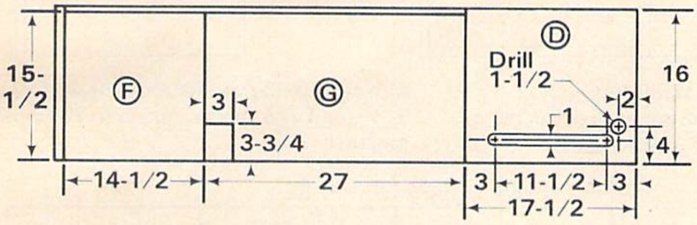

15-1/2
F
G
D
Drill 1-1/2
3
3-3/4
1
2
4
16
14-1/2
27
3
11-1/2
3
17-1/2

Fig. 4—Section Y

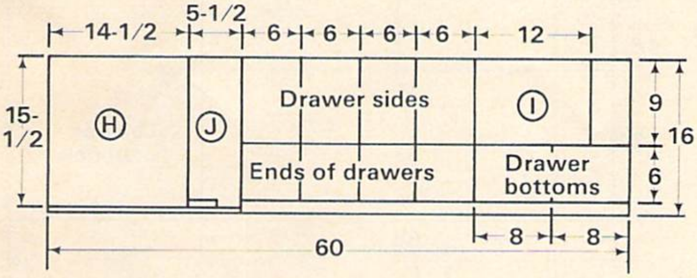

14-1/2
5-1/2
6
6
6
6
12
15-1/2
H
J
Drawer sides
I
9
16
6
Ends of drawers
Drawer bottoms
8
8
60

Fig. 5—Section Z

Bill of Materials (smaller cart)

1	4 × 8 sheet, 1/2″ plywood
2	2″ wheels and hardware
2	Drawer pulls
1 lb.	6d finishing nails
	Materials for drawer fronts, workboard, handle

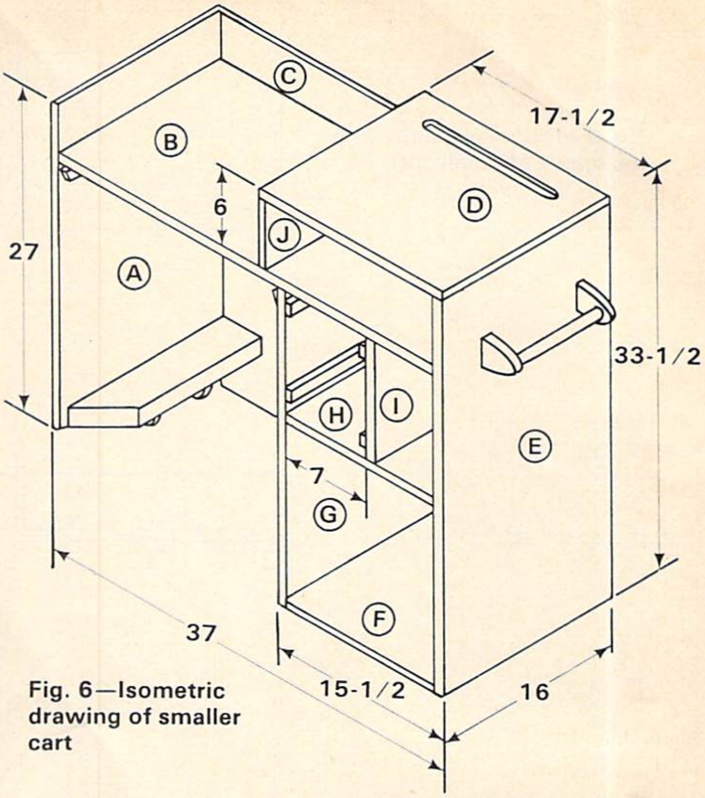
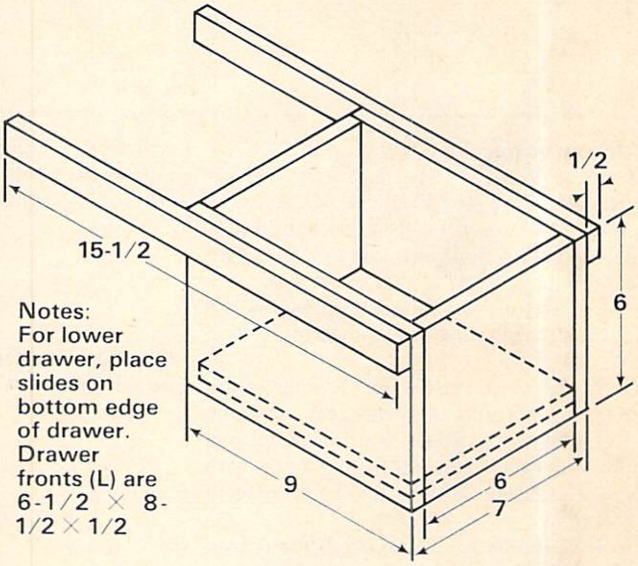

C
B
17-1/2
D
6
J
27
A
33-1/2
H
I
E
7
G
F
37
15-1/2
16

Fig. 6—Isometric drawing of smaller cart


1/2
15-1/2
6
9
6
7

Notes:
For lower drawer, place slides on bottom edge of drawer. Drawer fronts (L) are 6-1/2 × 8-1/2 × 1/2

Fig. 7—Drawer detail

Parts Key (smaller cart)

A	Left side
B	Desk top
C	Back
D	Stand top
E	Right end
F	Bottom
G	Inside leg
H	Shelf bottom
I	Shelf divider
J	Stand top, end piece
K	Workboard
L	Drawer fronts

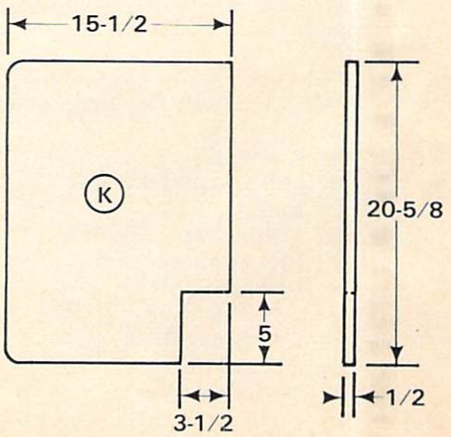

15-1/2
K
20-5/8
5
3-1/2
1/2

Fig. 8—Workboard

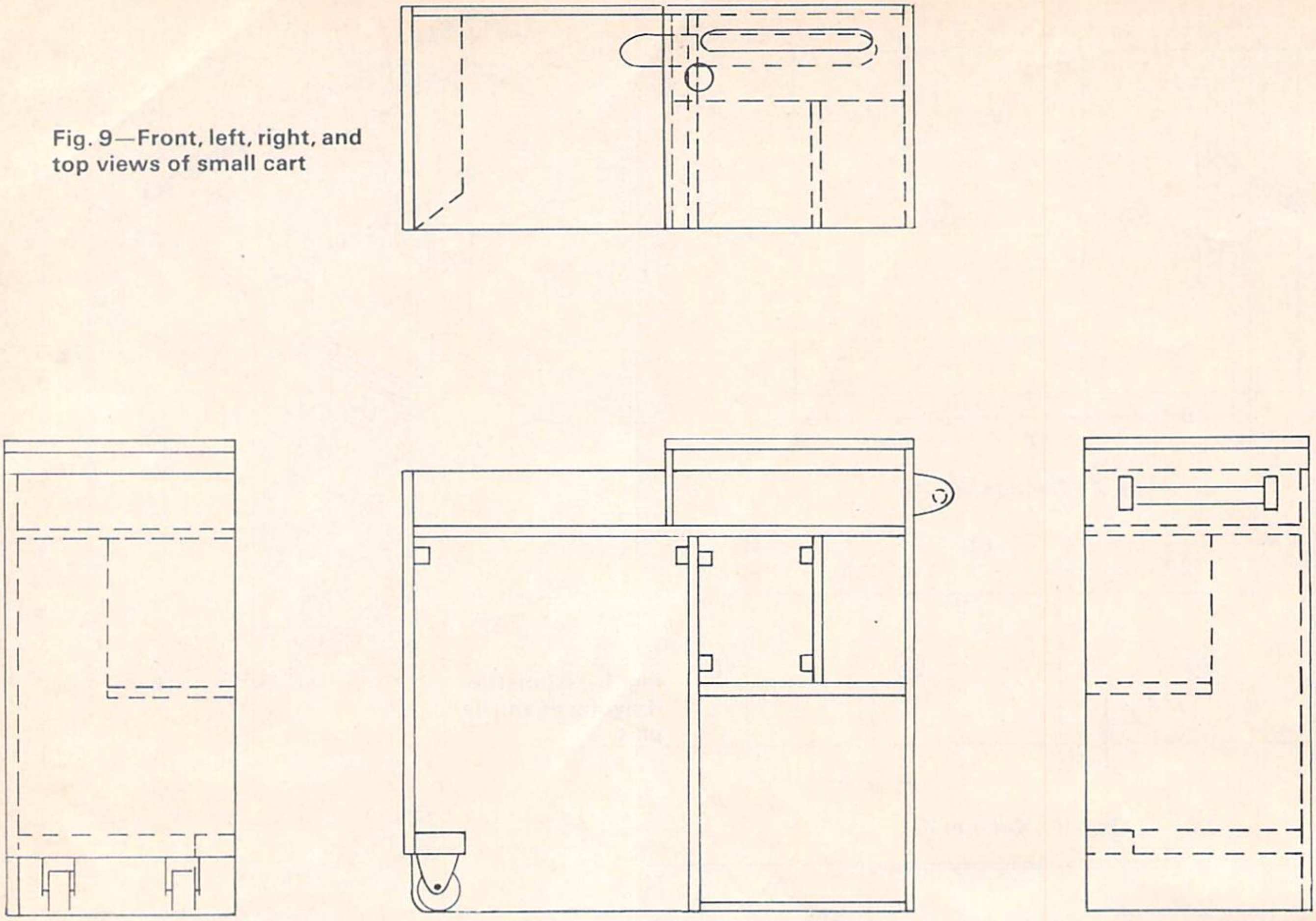


Fig. 9—Front, left, right, and top views of small cart

Construction

1. Lay out the four major cuts for sections W, X, Y, and Z (Fig. 1). When sawing, make each cut directly down the center of the line to minimize loss in size caused by the blade's kerf.

2. Carefully lay out each section by following the detailed drawings (Figs. 2, 3, 4, 5).

3. Cut parts A through H apart from one another and then carefully cut hole, slot, and notch details. It will be helpful in construction if you identify each part with its letter designation to avoid confusion in assembly.

4. Carefully sand the completed pieces, taking care not to round off the edges.

5. Begin assembly by fastening parts A, C, and E together, referring to the isometric drawing in Fig. 6 to determine proper edge alignment. For soundness of construction, use glue on all joints. It is *very* important to butt the pieces together properly for successful construction.

6. Nail H to I at the distance shown (7").

7. Using I as a spacer, nail G to H-I and F together.

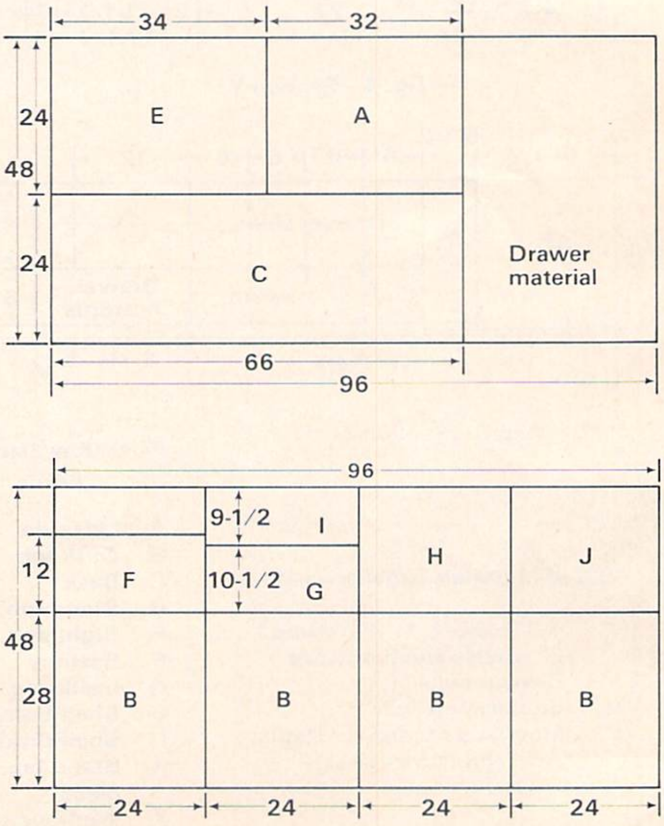


Fig. 10—Parts layout, larger cart ➧

Material: 3/4 plywood

Parts Key (larger cart)

1	A	Right end	32 × 24
4	B	Left end and dividers	28 × 24
1	C	Back	66 × 24
1	D	Counter top, Formica	
1	E	Right-side bottom	34 × 24
1	F	Left-side bottom	12 × 24
1	G	Left-side shelf	10-1/2 × 24
1	H	Computer shelf	20 × 24
1	I	Drawer bottom	9-1/4 × 24
1	J	Writing desk	20 × 24

8. Carefully position assembly A-C-E over G-H-I-F and fasten together, taking care to observe proper joint alignment while maintaining squareness of the structure.

9. Place B in position and secure in place.

10. Fasten J to D and then nail this assembly in place on top.

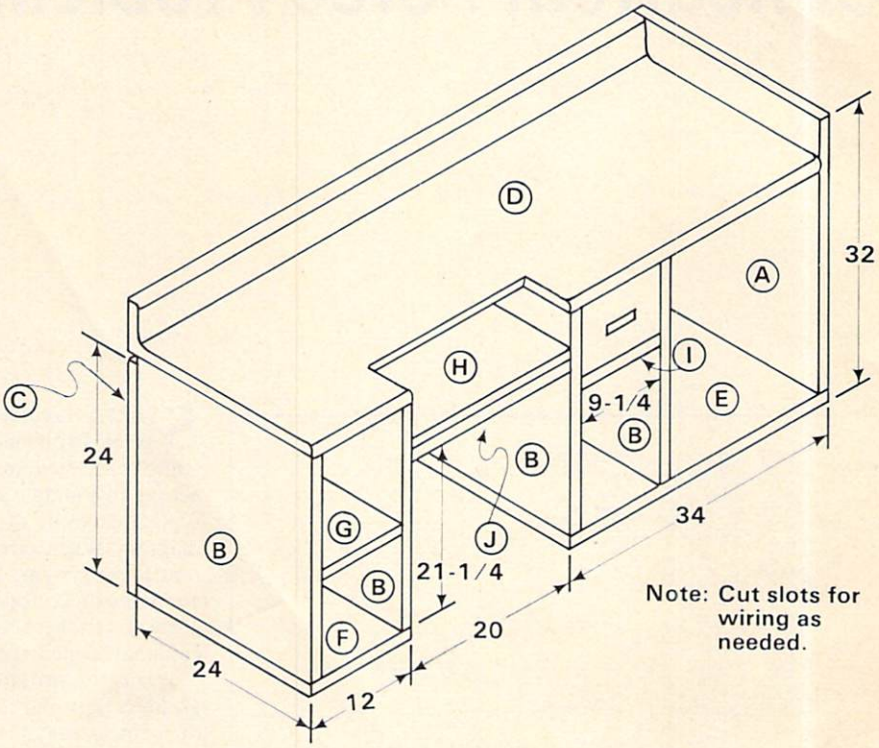
11. Study the drawer construction drawing (Fig. 7) and assemble the drawers. Remember that one set of slides goes on the top of the drawer and the other goes on the bottom edge. Drawer fronts can be made from any appropriate scrap material, such as pine board.

12. Using the drawer slides as a gauge, cut and place the rails for the slides into the cart drawer area.

13. The workboard (Fig. 8) can be made from a variety of materials; a scrap Formica piece makes a good writing surface. Nail two guide boards in positions shown to support it.

14. Attach wheels to one end. Attach a handle to the other end to aid in transporting the cart. The handle can be a spare you have on hand or can be made from wood pieces and a dowel or fabricated in your welding shop.

The larger cart. This easy-to-build unit also carries the full computer setup. One main power supply is used to power the computer, eliminating the need to unplug components to transport them. It has a built-in writing desk and provides more storage space for floppy disks, computer manuals, textbooks, and printer paper. Cost is under $150. (See Figs. 10 and 11.) ☐



Note: Cut slots for wiring as needed.

Fig. 11—Isometric drawing of larger cart

Using Hazard Warning Signs to Teach Mechanical Drawing

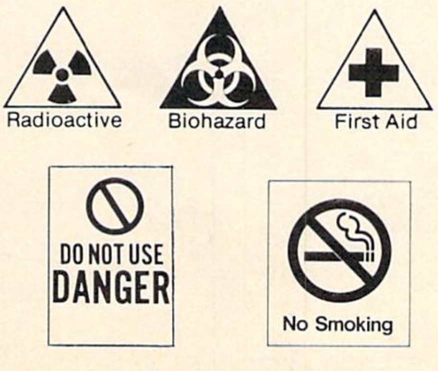
By John R. Bertoni

INCORPORATING current hazard warning signs into your basic mechanical drawing program can aid students in their careers. The unit is relevant and challenging and could develop into a mandatory learning experience for technology education.

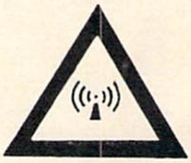
The example (Fig. 1) shows how to incorporate geometric construction, lettering, sketching, and inking into a study of hazard warning signs. Different signs can be assigned, depending on group level. For each sign, the instructor will need to supply students with dimensional requirements.

Lectures, class discussions, and research assignments in the warning areas and on safety in industry where the hazards exist can follow the basic drawing exercise. ☐

John R. Bertoni is an instructor, Maine-Endwell Senior High School, Endwell, New York.



Various warning signs



Radio Frequency Radiation Hazard Warning Symbol

Steps

1. Construct border and title box.
2. Construct a 7″ equilateral triangle.
3. Using the complementary angle of 30°, measure perpendicular to the triangle's sides to make them 1/2″ thick.
4. Through the process of finding the perpendicular bisector of a line, find the center of the triangle to locate the 1/2″ center circle.
5. Leave 1/4″ between frequency waves. Make their thickness also 1/4″.
6. Using the center of your 1/2″ circle, cut the waves at 45° angles.
7. The base of the truncated isosceles triangle coincides with the outer wave's outer edge; the top coincides with the inner wave's inside edge. The base is 1/2″ wide, the top, 1/4″ wide.
8. Darken the necessary areas and label.

Fig. 1

Program Solves Coplanar, Concurrent Force Problems

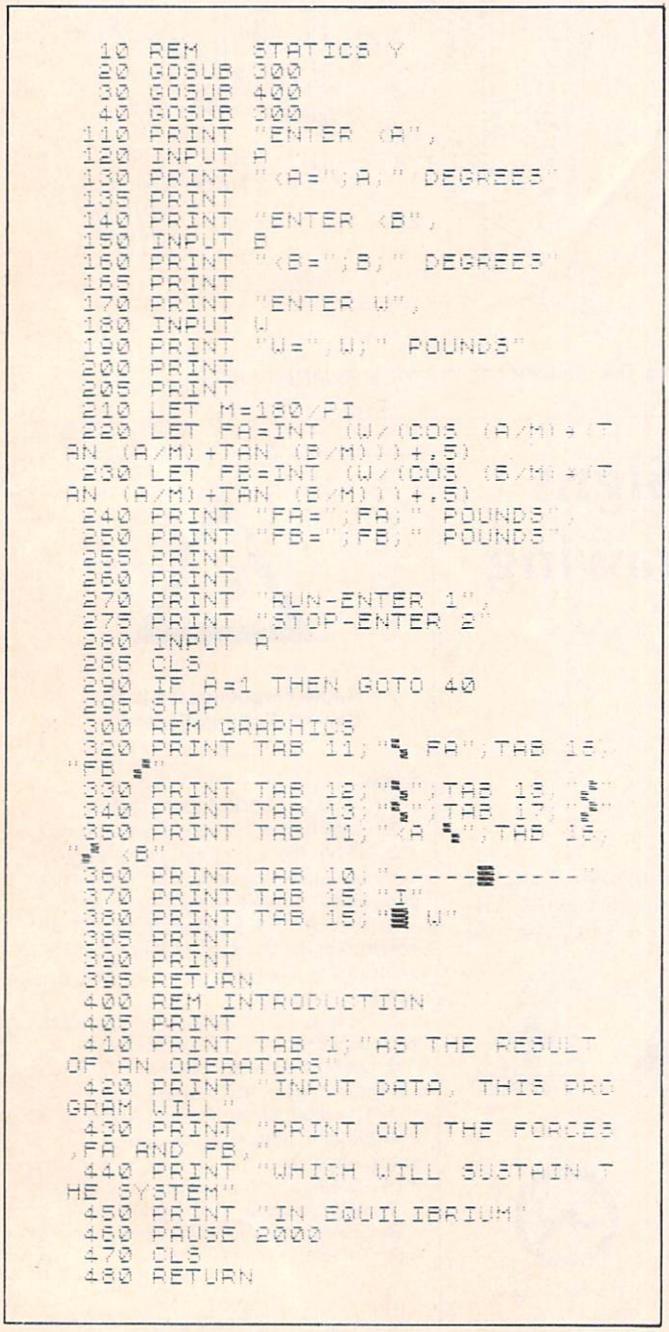
By Gerard J. Spillman

STATICS involves the forces or interactions of bodies on each other. Problems in statics derive from actual physical problems such as structures or machines. A diagram that shows forces acting on a body is called a free-body diagram. Figure 1 shows a typical example of converting a space diagram to a free-body diagram. When a free-body diagram involves a coplanar, concurrent force system, as this does, the problem can be solved by analytics or vector graphics. In either case, the computer program given here solves for the unknown forces in a three coplanar, concurrent force system.

When the program runs, a free-body diagram in computer graphics is displayed and identifications are shown. The operator then enters angles *A* and *B* of the unknown forces and weight *W* (equilibrant). The resulting concurrent forces, *FA* and *FB*, required to maintain equilibrium of the system appear on the screen.

The program as shown here is applied directly to a problem. However, you can also use it to verify calculated answers to problems of this type and for mechanical analysis by varying the angular relationships of the forces and/or *W*. ☐

Gerard J. Spillman is teacher of mechanical technology, Roosevelt (New York) Junior-Senior High School.



```
  10 REM   STATICS Y
  20 GOSUB 300
  30 GOSUB 400
  40 GOSUB 300
 110 PRINT "ENTER <A",
 120 INPUT A
 130 PRINT "<A=";A;" DEGREES"
 135 PRINT
 140 PRINT "ENTER <B",
 150 INPUT B
 160 PRINT "<B=";B;" DEGREES"
 165 PRINT
 170 PRINT "ENTER W",
 180 INPUT W
 190 PRINT "W=";W;" POUNDS"
 200 PRINT
 205 PRINT
 210 LET M=180/PI
 220 LET FA=INT (W/(COS (A/M)*(T
AN (A/M)+TAN (B/M)))+.5)
 230 LET FB=INT (W/(COS (B/M)*(T
AN (A/M)+TAN (B/M)))+.5)
 240 PRINT "FA=";FA;" POUNDS",
 250 PRINT "FB=";FB;" POUNDS"
 255 PRINT
 260 PRINT
 270 PRINT "RUN-ENTER 1",
 275 PRINT "STOP-ENTER 2"
 280 INPUT A
 285 CLS
 290 IF A=1 THEN GOTO 40
 295 STOP
 300 REM GRAPHICS
 320 PRINT TAB 11;"▚ FA";TAB 18;
"FB ▞"
 330 PRINT TAB 12;"▚";TAB 18;"▞"
 340 PRINT TAB 13;"▚";TAB 17;"▞"
 350 PRINT TAB 11;"<A ▚";TAB 16;
"▞ <B"
 360 PRINT TAB 10;"-----█-----"
 370 PRINT TAB 15;"I"
 380 PRINT TAB 15;"█ W"
 385 PRINT
 390 PRINT
 395 RETURN
 400 REM INTRODUCTION
 405 PRINT
 410 PRINT TAB 1;"AS THE RESULT
OF AN OPERATORS"
 420 PRINT "INPUT DATA, THIS PRO
GRAM WILL"
 430 PRINT "PRINT OUT THE FORCES
,FA AND FB,"
 440 PRINT "WHICH WILL SUSTAIN T
HE SYSTEM"
 450 PRINT "IN EQUILIBRIUM"
 460 PAUSE 2000
 470 CLS
 480 RETURN
```

Program

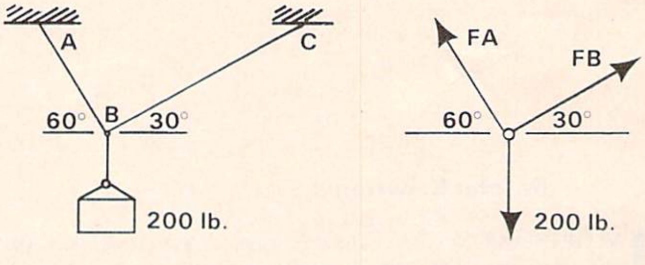
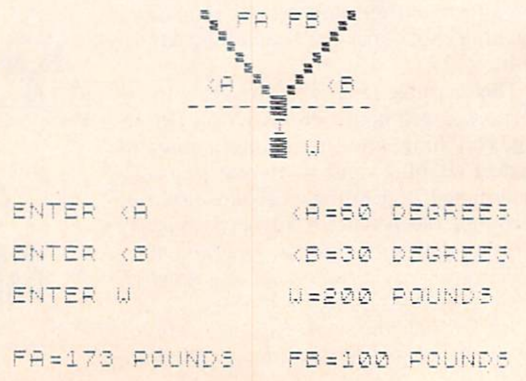


Fig. 1—Sample problem

Sample run

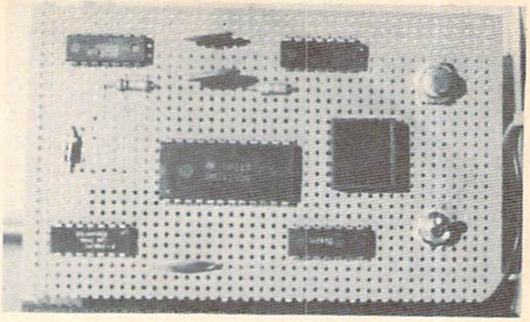


```
          ▚ FA FB ▞
           ▚     ▞
            ▚   ▞
          <A ▚ ▞ <B
         -----█-----
              I
              █ W

ENTER <A            <A=60 DEGREES
ENTER <B            <B=30 DEGREES
ENTER W             W=200 POUNDS

FA=173 POUNDS       FB=100 POUNDS
```

Priority Detector Catches Students' Attention



Top view of priority detector

By Joseph T. Szumowski

MY "quiz show" priority detector increases and sustains shop students' interest in question-and-answer sessions. Like those on a quiz show you might see on TV, it also unfailingly determines who responds first. The easy-to-wire device consists of inexpensive, readily available parts—specifically, five IC chips, six resistors, four capacitors, and a seven-segment display in the circuit, and switches, wire, and a minibox for outside parts.

I use a battery, but you can easily substitute a 9 V battery eliminator or power pack unit.

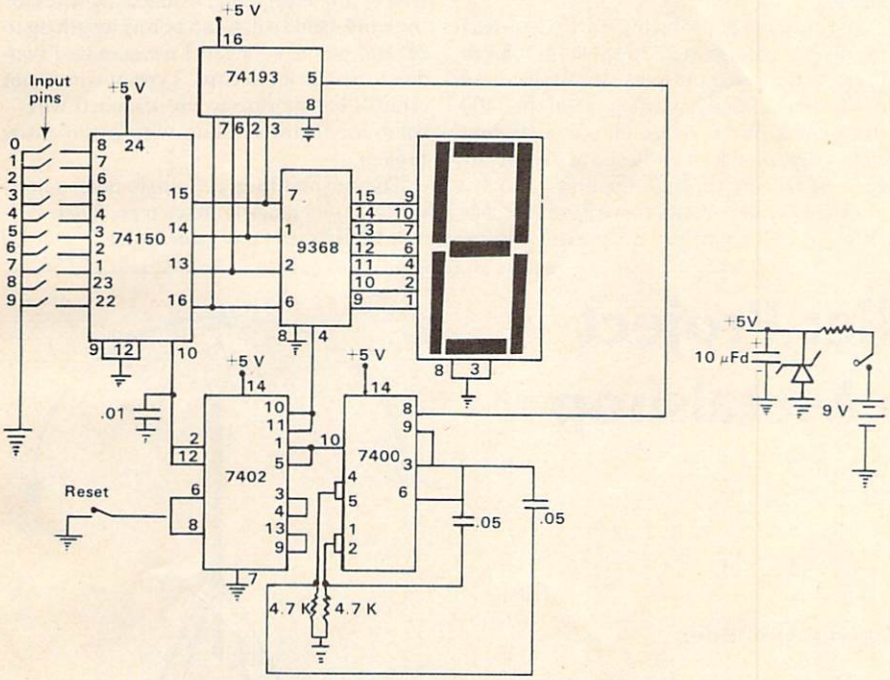

+5 V
16
74193
5
8
7 6 2 3
Input pins
+5 V
0
1
2
3
4
5
6
7
8
9
8 24
7
6
5
4
3
2
1
23
22
74150
15
14
13
16
9 12
10
7
1
9368
2
6
8
4
15 9
14 10
13 7
12 6
11 4
10 2
9 1
8 3
.01
+5 V
14
10
11
1
5
7402
3
4
13
9
2
12
6
8
7
Reset
+5 V
14
8
9
10
7400
3
4
5
6
1
2
.05
.05
4.7 K
4.7 K
+5V
10 μFd
9 V

Fig. 1—Schematic

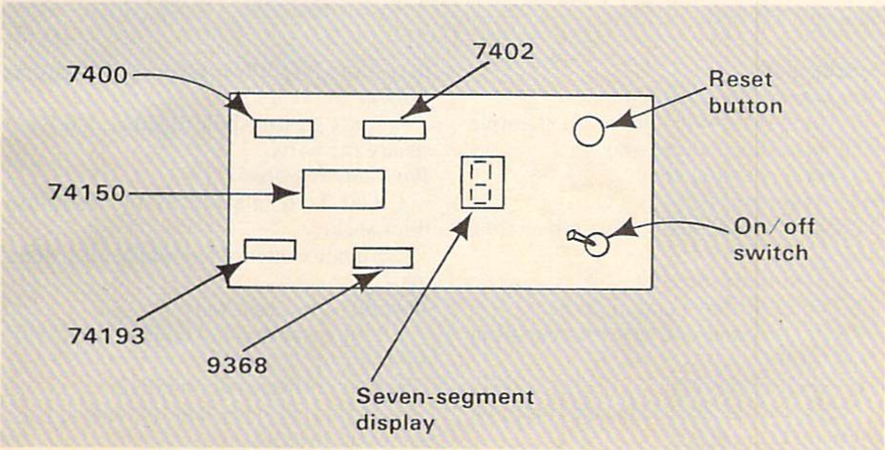

7400
7402
Reset button
74150
On/off switch
74193
9368
Seven-segment display

Fig. 2—Parts placement

How the circuit works. I use this circuit as a senior project in digital electronics. It employs a variety of digital circuits to accomplish the end result. Refer to Fig. 1 during the following description.

The action begins with the 7400 wired to a low-frequency oscillator or "clock." The clock provides an output to the 74193, an up counter. The outputs of the up counter, pins 7, 6, 2, 3, cause the 74150 at "one of ten selector" to scan the switches for a closure.

When a closure occurs, the 74150 generates an output pulse that stops the counter. The 9368 is a display driver and decoder that provides the needed outputs to drive the seven-segment display. When the counter (74193) stops, its output pins, 7, 6, 2, 3, provide the inputs to the display driver (9368). The decoder drives the LED display and the proper switch number, zero through nine, is displayed.

The display holds the number until the reset button is depressed. The reset clears the display and counting begins again. The 9368 is blanked during the counting period so only the selected digit appears.

You can easily expand the unit to display 16 switches, from 0 to F, for a total of 16 characters. Another modification allows display of up to 99, or 100 (0 to 99), switch closures.

Construction. Refer to Figs. 1 and 2 and the photo. You can vary the number of switches and the size of the minibox as needed. Wiring and parts location are not critical. Also, it's not necessary to use sockets for the chips—with a 25 W pencil iron, solder the wires to the pins. I prefer this method because the ICs are very reliable and you'll avoid the problem of inter-

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Joseph T. Szumowski is electronics instructor, Dobbins Vo-Tech Institute, Philadelphia, Pennsylvania.

mitting sockets—loose socket pins can be very discouraging.

Begin wiring by numbering all the pins, referring to Fig. 1 for pin numbers. Measure and precut the wires, keeping them short. Run all ground pins to a common return or bus wire. Connect the supply voltage pins. Use care not to short the ground wires to the 5 V supply.

Checking the circuits. When you complete the wiring, perform a few simple checks before applying power. Make a close visual inspection to insure that pins on the ICs do not touch each other unless so indicated on the schematic. With a red pencil, trace over each wire on the schematic as you check it on the detector.

Now, using the ohmmeter, take a resistance reading between ground and the supply bus (be sure the battery is out of the unit). Make sure also to place the ohmmeter's positive lead on the supply bus—if you connect the negative lead you will read through the zener diode, which may show a short circuit. Your reading should show at least a few thousand ohms. Because up to this point you haven't connected the outside switches, you don't have to worry about a short on one of the 74150's input pins.

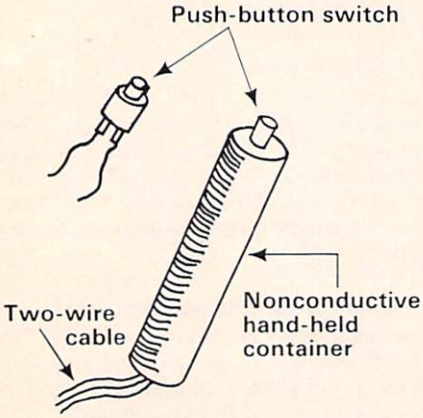

Fig. 3—Switch details

It should now be safe to connect the battery. After doing so, turn the switch on and connect your voltmeter to the supply bus. The voltage should be close to 5 V. Short any input pin of the 74150 to ground and the display should indicate the number of the switch pin. Remove the short and press the reset button to start the unit again.

If you have a problem, start by testing for proper voltage at all supply pins. Check for 0 V at all ground pins. If you have an oscilloscope handy, check pin 8 of the 7400 for a clock pulse. As you'll see, a student can easily learn to troubleshoot digital circuits by tracing through the unit.

Finally, you're ready to wire the switches (Fig. 3). Use rubber or plastic tubing approximately 6″ long. Connecting wires for the hand-held switch can be any length up to 25′ and perhaps longer. I use standard two-conductor ac lamp cord. Type of wire is not critical, but be sure to use stranded wire—solid conductor hookup wire is too easily broken.

Parts List

Qty.	Description
1	74150 selector (1 of 16)
1	74193 binary up/down counter
1	7400 quad nand
1	7402 quad nor
1	9368 decoder driver
1	Seven-segment LED display
10	Normally open pushbuttons
1	Normally closed pushbutton
1	On/off SPST switch
1	Minibox or plastic case
1	Sixteen-input terminal jack
2	4.7 kΩ resistors
2	.05 μF capacitors
2	.01 μF capacitors
1	Perfboard
	Connecting wires

The pushbuttons are single-pole, single-throw momentary contact type. Their current rating is not a consideration. ☐

Easy-to-Make Filler Project Gives Balance to Metalshop

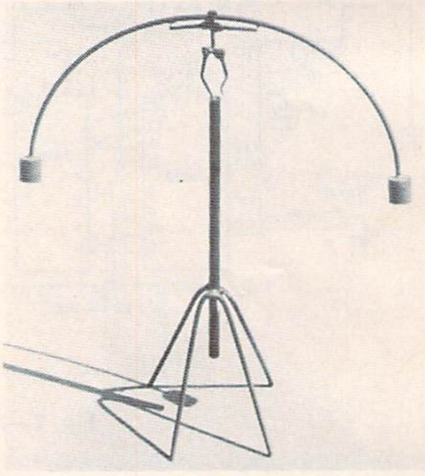

Photo by Tim Cunha

By Stan Turrini and Dennis Alexander

PROVEN in popularity and versatile in production time and training, this balancing man makes a great filler project. The project has a high success rate, is low-cost, and offers a change of pace for metalworking students.

The project takes only three or four class hours to complete. The only special materials required are five horseshoe nails which can be bought at a feed and grain or ranch supply store.

Though simple and short in production, the project does require the student to follow procedures, braze, machine, and use hand tools and equipment including the band saw, lathe or drill press, slip roller, and specialty jig. Stock could be precut and sorted but having students make their own stock selection from the shop supply and measuring it adds to their training. The completed project may be painted if the student desires.

Procedure

Man figure—one required

1. Study the photo and/or an example. Bend horseshoe nails as shown.
2. Braze nails together.

Pole—one required

1. Cut 3/8″ dia rod to 10″ length on floor shears.
2. Grind both ends flat.
3. Center drill one end on lathe.
4. Drill the same end to form a cup using a 7/8″ drill bit.

Legs—two required

1. Cut two pieces of 3/16″ dia rod to 12″ length on floor shears.
2. Bevel using disc sander, all ends.
3. Mark the center of each rod. Place rod in vise and carefully bend into "U" shape as shown.
4. Braze legs and pole together. Use jig to steady the parts.

Bar—one required

1. Cut 3/16″ dia rod to 18″ length on floor shears.
2. Locate center of bar and bend around jig.

Weights—two required

1. Using a horizontal band saw, cut 3/4″ dia rod to 3/4″ length.
2. Center drill each on lathe.
3. Drill 3/8″ deep hole on end of each using #11 drill bit.
4. Fit bar into weight and braze.
5. Braze bar to man figure. ☐

Stan Turrini and Dennis Alexander are industrial arts instructors, Will C. Wood Junior High School, Vacaville, California.

Microcomputers in Michigan's Vocational Education Facilities

By Richard Harris

DECIDING whether or not to buy a microcomputer is a minor dilemma compared with determining which micro is best for a particular situation. Part of my role as a trade-technical teacher educator involves supervising practice and intern teachers in various area centers and community colleges throughout Michigan. The rapid proliferation of microcomputer technology began to concern me a few years ago when I had to look twice to determine whether a lab was data processing or secretarial. My concern increased as micros grew commonplace in traditional graphic arts and machine tool labs, and I knew I needed to educate myself.

As I pursued "literacy" of the new phenomena, I found abundant free advice from hackers, salespersons, and other knowledgeable high-tech proponents. Most advice was valid and sincere, but little could be supported with solid data other than broad-based sales figures and impressive machine specifications. In my attempt to grasp what was occurring in vo-ed microcomputer applications, I proposed a sabbatical project that would allow me to pursue a limited survey in Michigan.

Performing the study. After approval of my leave for spring quarter 1983, I developed a survey instrument, with the help of my college's director of academic computer services, and mailed it to key administrators in area vo-tech centers and postsecondary occupational programs. Because I wanted to obtain a clear picture of vo-tech applications—and to exclude general education or other academic uses—I purposely left comprehensive high schools off my mailing list. My two-page questionnaire gathered data on both hardware and software.

Within 30 days of the first mailing, I had received a phenomenal 98 percent response, which provided hard data to analyze and report. I also planned selected on-site visits to interview professionals who use microcomputers in vo-tech education, a literature search, and a review of software sourcebooks and computerized data bases. The reviews were for use in developing a comprehensive software title index for vo-tech applications.

I designed the hardware portion of my questionnaire to produce a current and planned inventory of microcomputers and of cassette or diskette applications. I also inquired about current and planned use of computer networking. Questions about software were designed to assess administrative, instructional, and instructional support applications. My last major item pinpointed applications within each of six major vo-tech service groups (e.g., agriculture, home economics).

An annual microcomputer hardware inventory modeled after this investigation should be conducted in each state.

With the help of my computer programming expert, incoming data was organized and given preliminary analysis on a mainframe computer. I proceeded with telephone interviewing and a trip to the National Center for Research in Vocational Education (NCRVE) to meet with research specialists doing work on microcomputers. Several visits to sites within Michigan included interviews with staff consultants in the Vocational-Technical Education Services Division of the Michigan Department of Education.

Staff members of the Michigan Vocational Education Resource Center at Michigan State University made computerized data base searches for the study. This service saved a great deal of time in locating software titles appropriate for vocational-technical applications. It allowed me more time to manually search various printed software sourcebooks and to thoroughly review literature on microcomputers in education.

Three months of activity resulted in a 77-page report with 34 tables. Although the report is based only on what is happening in Michigan, it seems helpful to share an analysis of the project with a national audience. The phenomenally high response rate shows local administrators' great concern. I've also been invited to summarize the report at three vocational administrator workshops in Michigan and at two national conferences, and I've received requests for information from vocational educators from several parts of the country. Although my study covers only one state, it's very possible the findings reflect other states' situations as well.

Computer use findings. The current inventory reveals 29 microcomputer models in the 80 facilities from which I received responses. The manufacturers most commonly found in actual count and facility distribution are Apple and Radio Shack. A significant number of Commodore-Pet units also appear.

The picture changes, however, with data on purchases for fiscal year 1983-84. In this inventory, Apple and Radio Shack retain their ranking, but IBM takes third place. Further, the "planned" inventory only identifies 12 models compared to 29 in the "existing" list. The Apple Lisa microcomputer was the only new model cited. The total microcomputer inventory should have increased by almost 60 percent in 1983-84, with most growth at postsecondary vo-tech facilities.

Another major finding relates to inquiries about networking microcomputers. Broadly stated questions I formulated asked about plans to connect present and planned microcomputer systems to one another and to mainframes in a variety of settings. I found microcomputer networking to mainframes already in use at 25 percent of responding facilities. More important, those planning to extend the networking concept indicate that that number will almost double in the near future. Specific examples of planned connections include single classroom networks, tie-ins with large school system mainframes, tie-ins with university library systems, and establishment of regional networks for both intermediate and local school districts.

Software development or selection for application in a network creates concerns beyond those arising with a microcomputer that operates in isolation for a relatively narrow set of objectives. The strongest current application of micros networked to mainframes involves teaching computer languages. This will probably become more varied as linkages are established between administrative offices, job placement counselors, and diversified instructional settings.

Software. The second part of my study concerned microcomputer software. Ap-

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Richard Harris is professor of trade-technical education, Center for Occupational Education, Ferris State College, Big Rapids, Michigan.

plications for administrative chores and business education curricula dominated all other areas. Respondents identified word processing and accounting as the most frequent applications. While business education curriculum outpaced all other vocational service areas with an 80 percent indicated use rate, industrial-technical curriculum applications ranked second with over 40 percent. While home economics and agriculture programs failed to show significant use, this was probably due to the fact that comprehensive high schools—where these programs are traditionally strong—weren't surveyed.

Inquiries about applications reveal significant use of computer-assisted instruction. I found disappointing the relatively few instances noted for computer-managed instruction and the complete absence of identified simulation activities. It was also somewhat surprising to find the use of micros for instructional support services—generating tests, record keeping, and faculty word processing—generally weak. Although substantial commercial and public-domain software is currently available to accommodate these teacher tasks, they apparently haven't found their way into the systems surveyed.

The software title search produced a longer list than I'd expected. My completed index serves only as a starting reference for identification of appropriate software sources; I made no attempt in the title index to analyze quality or suitability in terms of curriculum. The index was developed from a review of three published software guides, five nationally available computerized data bases, and two statewide reference listings for vo-tech education. One of the Michigan listings has already developed into a national microcomputer software exchange for vo-tech programming. You can obtain further information on it by contacting Dr. James Hannemann, Consultant for Vocational-Technical Education, Oakland Intermediate School District, 2100 Pontiac Lake Rd., Pontiac, MI 48054.

Another significant finding was the wide array of microcomputer models appearing on the inventory compared with the small number of software titles. This reveals purchase of a great deal of expensive hardware without thorough investigation of appropriate software availability. This type of problem seems almost inevitable with the public demanding that education get into the mainstream of high technology.

Recommendations. The fundamental question arising from any investigation of this type is: "Where do we go from here to improve the situation or solve identified problems?" The six recommendations I give below may require a major reprioritization of professional development needs and re-allocation of resources. I assume the following recommendations have some relevance for every state.

- Expand teacher training—There is need for considerable education in both computer literacy and the broader implications. These broader implications include applications of "user friendly" microcomputer technology both in the instructional process and the changing workplace where microcomputers are becoming commonplace. In the U.S., an estimated 75 of 100 workers will use a computer in their day-to-day occupational routine by 1990.
- Develop a vo-tech software data base—Since storage and retrieval of usable data is the essence of computer technology, it seems absurd for vo-tech educators with common needs to spend countless hours searching and reviewing publications that seldom perceive them as potential clients. Therefore, each state should establish a clearinghouse to allow networking of a centralized software data base to all vocational educators. This base would include vital data about each program and a sanctioned rating system. Because of the diversity of curriculum within states, it is probably most feasible for each state to have its own data base with linkage capability between states.
- Develop a software assessment or rating system—The NCRVE has taken a first step by creating an instrument for vocational educators that will be available soon. Implementation of this and other sanctioned assessment devices will give users a way to measure quality and appropriateness of material to the intended instructional application.
- Perform an annual hardware inventory—An annual microcomputer hardware inventory modeled after this investigation should be conducted in each state. The data would assist users and potential users in acquiring hardware and software. Comparing this information with that acquired from an appropriate software data base would improve decision making.
- Assess software applications—An annual assessment of microcomputer software applications for administration and instruction would be beneficial.
- Create a high-visibility "microcomputers in vo-ed" awareness program—Such a program would reach beyond the goals cited for teacher training. It might include efforts to make parents and students more aware of America's changing workplaces and the need to develop skills for information-age technology. Conferences, commercials, newspaper releases, and other media announcements would help ensure public support for updating vocational programs to prepare youth and adults for tomorrow's jobs.

In the spring of 1984, a follow-up to this study was initiated. The extended survey includes Michigan and its bordering states. At SCHOOL SHOP press time, the data was being compiled and analyzed for a formal report. Copies will be available at a nominal fee from: Center for Occupational Education, Ferris State College, Education 200, Big Rapids, MI 49307. ☐

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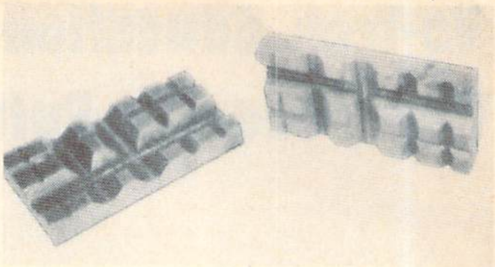

By Patrick M. Inda

THE set of multi-sized V-blocks described here will hold solid or tube round stock in a vise during drilling, boring, reaming, or threading operations. They are especially useful to beginning students.

The blocks permit holding more metal than the normal vise will accommodate because V-blocks have four points of contact compared with only two points of contact in a vise. They are held between the jaws of any vise, limited only to your need or use. The pressure of the vise against the V-blocks prevents materials from rotating.

You can drill holes in the end of stock or through its diameter when using the blocks. They are not designed to hold materials that require exertion of great pressure to make a hole. I have, with care, drilled 3/8″ diameter holes. You may need to drill a pilot hole.

The blocks will also cut down on resetting the vise. When drilling a hole into the end of a rod, you'll eliminate having to change to a vise with a V-groove or disassemble the vise you're using and reassemble it on its side with the V-slot exposed.

Construction and use. Each set of V-blocks will require one piece of medium- or high-carbon steel, 2-1/2″ × 8-1/4″ × 9/16″ rough size. The two finished pieces will measure 2″ × 4″ × 1/2″ with ± 1/16″ od tolerance and ± 1/64″ V-groove tolerance. To make the V-blocks:

1. Machine the blank plate to size, forming width and thickness first. Be sure to maintain squareness. Machine the V-grooves lengthwise. Note that all V-grooves are 90° (Fig. 1).
2. Saw or mill the pieces to 4″ length, maintaining squareness. You can surface grind to obtain 4″ lengths after dividing.
3. Machine both pieces at the same time widthwise to obtain identical V-grooves (Fig. 2).

To use the blocks, (1) place the stock in a matching pair of V-grooves, (2) place the blocks in the vise so that they rest on the vise ways, and (3) align and secure the materials in the vise for drilling operations.

If your shop doesn't have a shaper or milling machine, a local machine shop or more advanced program within your school may make a set of V-blocks for you. ☐

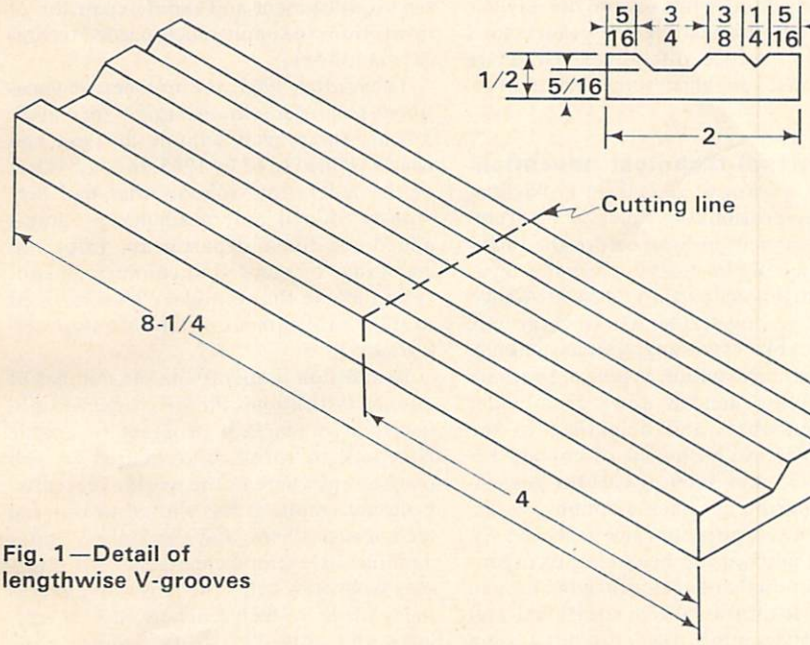

Fig. 1—Detail of lengthwise V-grooves

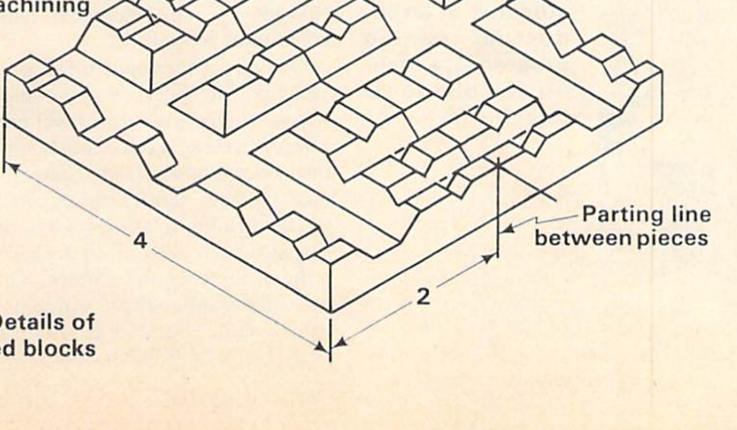
1/4
1/8
5/16
5/8
1/4
3/4
1/2
3/8
5/16
1/4
1/4
1/2
5/16
4
Typical appearance after machining
Parting line between pieces
4
2

Fig. 2—Details of completed blocks

Patrick M. Inda is industrial education instructor, Parker Senior High, Janesville, Wisconsin.

Vo-Tech Education in Nigeria: Past Progress, Future Challenges

By Sam I. Okwuanaso

VOCATIONAL-TECHNICAL education has received inadequate attention in Nigeria, even during the period from 1951 to 1966, which witnessed an unprecedented explosion in numbers of schools and students throughout the country. Ten years of involvement in the struggle to develop a tenable Nigerian vocational-technical program have given me an opportunity to observe the problems firsthand. In this article, I will consider present dilemmas and problems with their historical precedents and current efforts to resolve them.

Background. Nigeria, a country of 346,669 square miles on Africa's west coast, has 85 million people, the largest concentration in sub-Saharan Africa, which represents almost one-fifth of the population of the entire continent. Per capita income remains low—only $300 per year despite large quantities of oil produced in and exported from Nigeria in the past 30 years.

Literacy is about 20 percent. The educational system provides a six-year compulsory primary program. A six-year, two-tier secondary program offers academic, vocational, and commercial education. Polytechnics and colleges of technology give postsecondary technical, commercial, and business training while several universities offer programs leading to a bachelor's degree in various disciplines. Graduate courses are available in some older universities.

Vocational-technical education. The oldest form of education in Nigeria, informal vocational-technical skills training was carried on long before the introduction of Western-style formal education. Indigenous education covered such skills as weaving, leather working, carving, sculpture, blacksmithing, pottery making, and home construction as part of the practical training handed down from older family members and neighbors to the young. The establishment of courses between 1955 and 1960 in various government departments, such as public works, the railway corporation, and posts and telegraphs, marked the beginning of organized vocational and technical education in Nigeria. Institutionalized vocational and technical education in schools didn't begin until the late 1950s.

The formal system initially accorded low priority to vocational-technical education. Recommendations of the Ashby Commission on Post-School Certification and Higher Education influenced Nigerian governments to pay greater attention. That commission, among others, recommended the establishment and rapid expansion of institutions to supply much-needed technical manpower.

Thus, after 1963, the number of vocational-technical schools rapidly increased. Twenty-three such schools in 1960 had nearly trebled to 63 by 1965. In some states of the federation, schools that had previously offered only academic programs added vocational departments. Efforts to encourage technical and commercial education above the secondary level resulted in the establishment of ten technical colleges by 1973.

In addition to increasing the number of vo-tech institutions, the government established a scholarship program to enable Nigerians to enroll in accredited vo-tech courses anywhere in the world. Presently, program emphasis has shifted to training technical teachers, and the United States Technical Development Agency for Overseas Countries helps the Nigerian government place vo-tech teachers in U.S. colleges and universities and monitor their progress.

Finally, the federal government decided to offer training at local and state technical colleges and vocational schools. This training was free to everyone from 1976 to 1981, but in 1982 the government, suffering from decreased oil revenues, started to restrict its support for no-cost training to local, federally established institutions. Most state governments, unable to assume the entire cost of training, instituted tuition charges at state technical colleges and vocational schools.

Outside the vocational preparation available in Nigeria's few comprehensive schools, vocational-technical education is offered in three types of postprimary facilities: craft schools, trade centers, and technical colleges. Craft schools offer prevocational training to students who have completed primary school to prepare them for admission to trade centers. Their three-year programs expose students to vocational choices and provide education in such basics as English, math, and general

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Sam I. Okwuanaso is senior lecturer, School of Technical Teacher Education, Institute of Management and Technology, Enugu, Nigeria.

Civil engineering students in an industrial training program at a technical college in Enugu

science, with a vocational orientation. There is no specialization of job training and all students also take technical drawing, painting and decorating, woodworking, and metalworking.

Craft school graduates proceed to trade centers whose curricula and requirements vary throughout the country. In some, students take all available courses from the first year on. In others, they are given an introduction to all training areas, then decide on specialized vocational courses. In most trade centers, however, students enter directly into the vocational program of their choice.

The trade centers do not award a diploma, but instead prepare students for the London City and Guilds examinations and/or the Nigerian Ministry of Labor trade tests. Core course work typically includes electrical installation, radio and TV maintenance, motor mechanics, metal fabrication and welding, brickwork, concrete work or masonry, and carpentry and joinery.

Nigeria's technical colleges typically offer more comprehensive and advanced instruction than the trade centers, in such technical and business fields as mechanical, civil, electrical, and construction engineering; accounting; management; and secretarial studies. They are generally considered postsecondary or higher education institutions on the same level as universities. In recent years, some changed their names to college of technology or polytechnics to reflect this status. Course work is offered full or part time, days or evenings, and leads to the ordinary national diploma, the higher national diploma, or the higher certificate of the City and Guilds of London Institute.

Students at a trade school in Enugu learning to lay concrete blocks

Vo-tech education's problems. Despite extensive public funds invested in vocational-technical education, one of the government's main objectives—significant reduction in youth unemployment—remains. Lack of vocational-technical jobs, low wages, and lack of salable skills among vo-tech graduates contribute to the problem.

The employment market for products of Nigeria's vocational-technical schools is more prospective and theoretical than real. Employment opportunities are not plentiful and technicians are not well paid. These factors encourage many students to emphasize academic education and thereby undermine government efforts to develop vocational-technical education and employment opportunities. Until industrial development becomes more advanced and visible, the preference for academic education will be difficult to change.

Financial problems also face vocational-technical education in Nigeria. Vocational-technical facilities and programs, even in their crudest forms, are more expensive than comparable academic programs. Comparison of the two kinds of institutions shows the cost of building, equipping, and maintaining a vocational-technical facility to be three times that of an academic school. In Nigeria, the unit cost per student in the institutions is at almost a 4:1 ratio. Maintaining and equipping existing and future vocational and technical programs relates directly to their ability to train graduates who will possess salable skills and will not need retraining by their employers.

The current approach of setting vocational-technical schools apart from mainstream secondary education presents another problem. A secondary vo-tech program physically separated from academic education tends to attract second-rate students and, thus, perpetuates the disdainful attitude toward technical education fostered by Nigeria's emphasis on academically oriented education.

Vo-tech education in Nigeria also faces a lack of trained and qualified vocational teachers. Only the University of Nigeria, Nsukka, and very recently Ahmadu Bello University, Zaria, produce a few such teachers annually. There is, therefore, great need for well-qualified vocational teachers to meet the diverse manpower needs of a rapidly developing economy and to cater to the individual abilities and aptitudes of a rapidly growing heterogeneous secondary school population.

Finally, Nigerian schools lack vocational guidance. As noted in a United Nations report, African schools need stronger guidance programs than those in Europe because many parents, illiterate or undereducated themselves, can scarcely reach well-informed decisions about their children's future. Feedback through research studies shows that well-informed and -counseled students make better vocational choices than uninformed, uncounseled ones and that the former enjoy their work more and achieve more than those who stumble into their jobs by chance.

Closing comments. Recent measures by Nigerian governments to promote vocational-technical education are encouraging. To ensure realization of the objectives of these measures and improvement in the quality of vo-tech education, several steps must be taken.

Current programs in vo-tech schools should be modified to suit Nigerian conditions. They should prepare talented business students to identify commercial, service, and production needs and to establish small businesses of their own to meet these needs. Necessary start-up funds and experienced advice should be made available for qualifying enterprises. Vocational preparation programs should concentrate on groups of related occupations, rather than on teaching singular skills. This type of organization, known as the cluster concept in vocational programming, is essential to turning out versatile graduates who are able to perform more than one job within an industry or occupation.

In planning vocational-technical programs, Nigerian governments must determine costs realistically and ensure maximum utilization of school facilities. ☐

References

Ali, A.A. 1977. "The Government and Technological Advancement in Nigeria." Paper presented at Technological Week, Enugu, Nigeria.

Fafunwa, A. Babs. 1974. *History of Education in Nigeria.* London: George Allen and Unwin.

Federal Ministry of Information, Nigeria. 1977. *Federal Republic of Nigeria National Policy on Education.*

Sanu, E.O. 1977. "Nigeria Today." Lecture delivered at Michigan State University, East Lansing.

UNESCO. 1962. *Final Report of the Meeting of Experts on the Adaptation of the General Secondary School Curriculum in Africa.*

World Bank. 1981. *Accelerated Development in Sub-Saharan Africa.* Washington, D.C.

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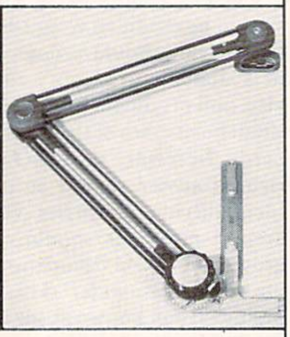

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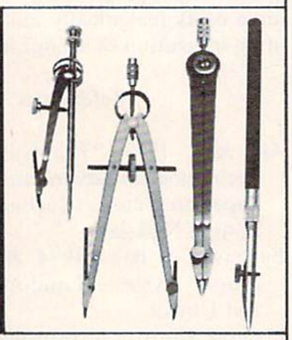

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Circle No. 21

Word Search Puzzle Aids Recognition of Computer Terms

By Robert A. Chin

THIS word search puzzle contains 41 terms associated with computers and computer systems. The words appear horizontally, vertically, and diagonally, both forwards and backwards. The solution is given on page 71.

Robert A. Chin is an instructor, Department of Industrial, Technological, and Occupational Education, University of Maryland, College Park.

D	E	C	M	C	N	T	K	S	I	D	C	C	X	N	B	X	Q	G	X	A	P	E	J	K
W	B	E	O	O	B	T	A	G	H	A	R	D	W	A	R	E	H	L	V	R	C	H	A	C
V	N	C	L	D	P	O	M	M	A	J	J	J	I	P	Y	S	Y	M	I	L	A	O	Y	G
N	N	C	E	I	E	E	O	T	I	U	C	R	I	C	D	E	T	N	I	R	P	F	Q	Q
I	M	Z	Y	N	F	G	R	T	F	S	J	F	L	B	E	R	T	J	B	I	N	A	R	Y
C	A	A	C	T	T	Y	C	A	S	M	C	C	J	K	V	E	K	D	Q	C	O	D	O	I
R	I	R	R	N	Y	R	R	O	T	T	C	P	Y	Q	R	K	C	O	M	P	I	L	E	R
C	E	N	W	G	R	L	A	O	N	I	R	O	S	S	E	C	O	R	P	O	R	C	I	M
B	L	T	W	K	O	E	E	L	M	N	N	A	M	C	Q	N	K	L	E	Z	A	C	O	V
Z	C	L	U	N	M	R	D	V	P	E	E	G	P	B	E	W	N	P	V	F	O	Y	E	M
P	T	A	X	P	E	T	P	I	I	R	M	C	S	I	M	U	T	B	E	M	F	T	B	R
D	K	M	T	F	M	R	G	M	S	T	O	Y	T	Y	R	A	S	Q	M	T	U	U	G	R
C	S	I	D	S	S	O	Z	S	O	P	C	C	L	O	S	Y	I	A	W	C	Y	H	B	L
J	J	C	K	U	S	E	C	N	C	N	L	A	E	N	R	T	N	N	E	N	K	B	A	N
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V	N	A	G	K	C	L	X	E	W	O	A	P	O	N	T	I	A	X	R	U	M	V	Z	E
Q	O	X	L	W	A	M	N	Z	D	T	D	F	A	R	E	N	N	E	A	O	G	O	T	W
U	S	E	M	G	M	Z	N	A	A	O	F	A	I	R	O	D	I	G	R	Z	N	U	R	V
U	E	H	U	V	O	W	T	F	D	X	M	O	O	C	G	E	E	E	U	L	P	O	L	Y
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V	M	R	O	S	R	U	C	W	N	E	N	I	T	U	O	R	M	U	L	W	E	O	V	E

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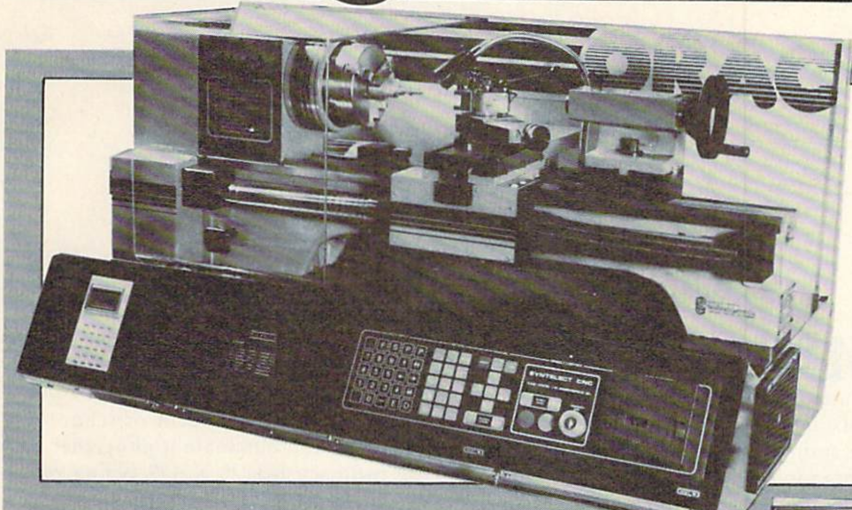

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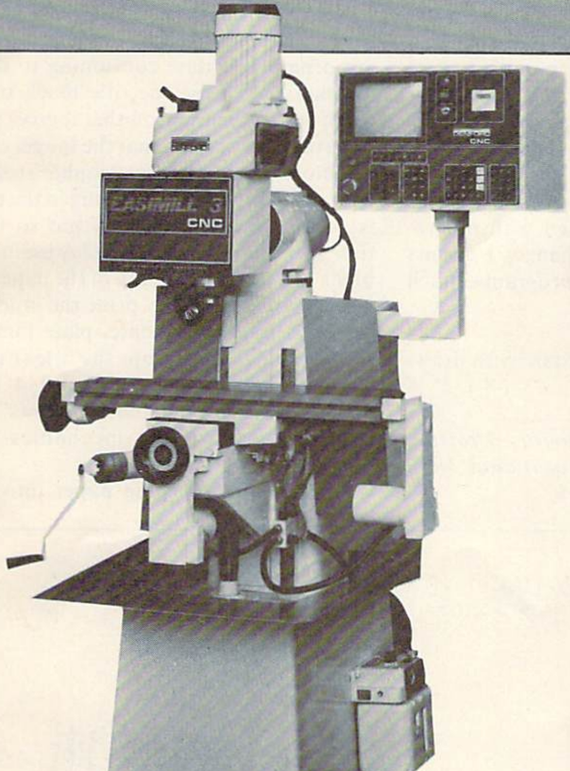

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Perspective

Make Drafting Relevant to On-the-Job Needs

By Dom Visone

MANY schools successfully teach mechanical trades, such as auto mechanics, aviation mechanics, and related fields, but fail to give their students effective training for the drafting they'll perform in industry. I find it appalling to see students in a vocational high school drawing class doing mechanical or related drawing work using T-squares, boards, and so forth. Later, on the job, many of these students will never have to do a perfect mechanical drawing—a sketch will satisfy any need that may arise. The only tools they'll need are a 2H pencil, a ruler, a compass, and an eraser. Let's cut out the frills and wasted time associated with our related drafting courses. Changes I discuss here can save drafting programs much money and time.

Another approach. Start with drawing paper. Generally, we use an 8-1/2″ × 11″ cream-colored sheet, which is very expensive, hard to erase, and hard to keep clean. In the course of a year, it can be a costly item for the student or school district. You can eliminate it altogether and use ordinary 8-1/2″ × 11″ typing paper with surprisingly good results.

Next, consider the title blocks usually found at the bottom of the paper. Many are ornate and time consuming to draw. Teachers often use the title block to kill time, on the assumption that it gives good lettering practice and that the longer doing the block takes, the less trouble students will cause. I agree that lettering in the block is very important, but why put so much time and information into it? A useful title block can be put at the top of the paper and it is only necessary to print the student's first and last names, date, plate number, class period, and perhaps the title (Fig. 1). The lettering should be 1/8″ and 1/4″ high. Again, remember that most students' main line of work will be mechanics—not drafting.

Next, fold the typing paper into four

Dom Visone is instructor, Drafting Department, Burgard Vocational High School, Buffalo, New York.

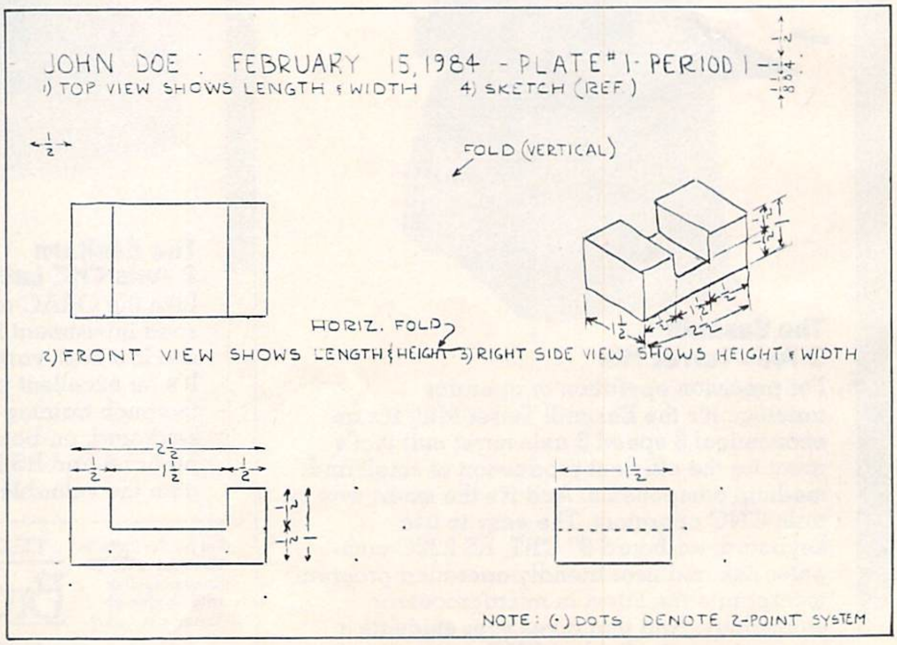
JOHN DOE : FEBRUARY 15, 1984 - PLATE # 1 - PERIOD 1
1) TOP VIEW SHOWS LENGTH & WIDTH
4) SKETCH (REF)
FOLD (VERTICAL)
HORIZ. FOLD
2) FRONT VIEW SHOWS LENGTH & HEIGHT
3) RIGHT SIDE VIEW SHOWS HEIGHT & WIDTH
2 1/2
1/2
1 1/2
1/2
1 1/2
NOTE: (·) DOTS DENOTE 2-POINT SYSTEM

Fig. 1—Sample drawing

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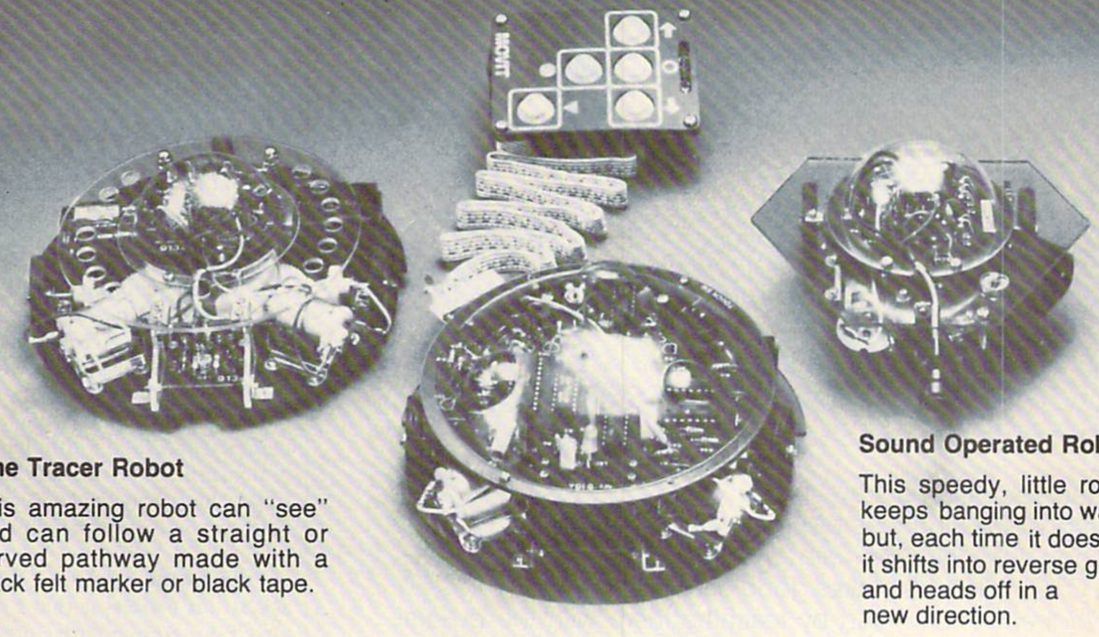

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quadrants. Don't substitute pencil lines for the folds. In certain views, the folds overlap other lines—having lines in place of the folds creates confusion. Number the upper left quadrant 1, the lower left 2, the lower right 3, and the upper right 4. In quadrant 1, print the 1/8" high label "TOP VIEW SHOWS LENGTH AND WIDTH;" in number 2, "FRONT VIEW SHOWS LENGTH AND HEIGHT;" in number 3, "RIGHT SIDE VIEW SHOWS HEIGHT AND WIDTH;" and in quadrant 4, "SKETCH."

The sketch is obtained from the problem or instructions given by the teacher. I recommend drawing the sketch in first exactly as given by the teacher, using no instruments and including all dimensions and notes. This sketch has a dual purpose: it promotes accurate and neat copying of information and gives the student practice with sketching.

Now start the solution of the orthographic projection. Let the student find the longest line from the sketch and place it horizontally in quadrant 1. This is the length. After leaving school, the student may take timed civil service, armed forces, or other exams. This step of finding the length and placing it on the drawing paper will save much time and will get the test taker started immediately, without too much thinking.

Next, about 1/2" from the left margin, find the width and place it vertically in quadrant 1. Project all lines downward into quadrant 2 and draw a horizontal line about 1/2" from the horizontal center of the fold across into quadrant 3. Find the height—the dimension going up in the sketch—and put it in quadrant 2. This completes the front view for now.

Move to quadrant 3. Add the width to the height, which is already there. If there are other lines, project them into their proper places. Put hidden lines in the proper views. Now, between the views, put in your dimensions, which should show height, length, and width. Do not duplicate dimensions after this has been done. To finish your drawing, add notes or other pertinent data. All work should be checked.

Two-point system. What's notable about this process is that I have not used any T-squares, boards, precision instruments, or fancy paper. I have used the two-point system that I devised many years ago and is still used at my school.

This system uses the top edge of the paper as a starting point. Note that the top edge is always a perfect straight line. Use two points as measured from either end and connect the points.

You'll find that your students produce results as good as those of technical students, maybe better. They'll accomplish this three times more quickly and with substantial savings in materials.

If anyone has questions, please contact me: Dom Visone, Drafting Department, Burgard Vocational High School, 400 Kensington Ave., Buffalo, NY 14214. ☐

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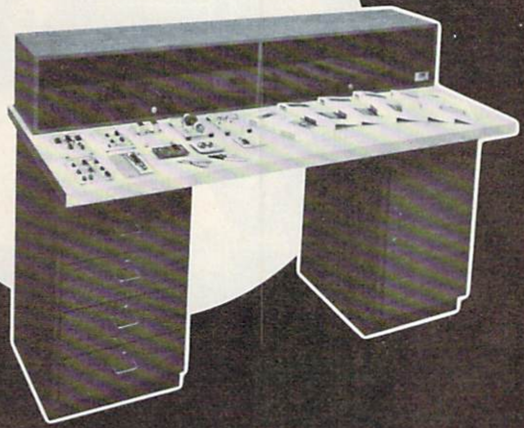

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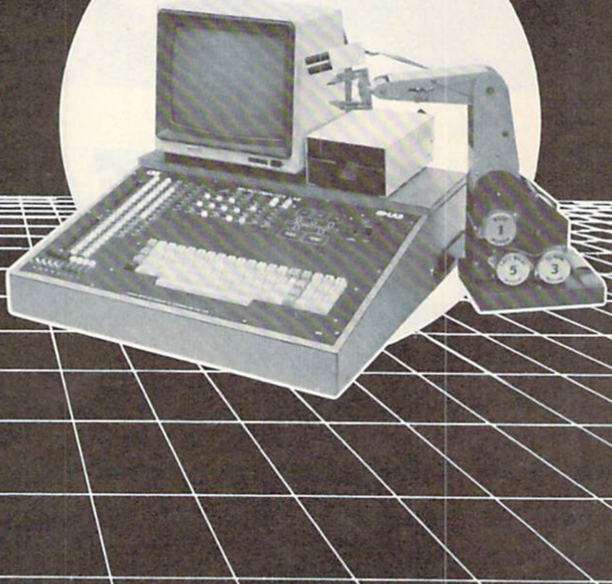
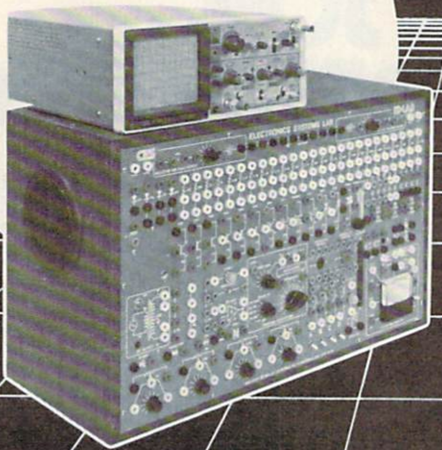
AND ROBOTICS



ELECTRONICS AND
COMMUNICATIONS & CONTROLS



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Some Army skills can qualify your students to accumulate money for college. Through the Army College Fund, soldiers contribute part of their Army pay each month, and the government matches it five dollars to one (or more). It can total up to $15,200 for a two-year enlistment or up to $20,100 for longer enlistments.

If your students are looking for the best in skill training, they should look into the Army. They can get all the details from their local Army Recruiter (the number's in the Yellow Pages). America depends upon a skilled Army, and upon the skilled people we train.

ARMY.
BE ALL YOU CAN BE.

Circle No. 27

Directory of Federal and State Officials

This list of federal and state officials in vocational and industrial arts education was made possible through the cooperation of state directors of vocational education, federal education offices, and, in Canada, the dominion office of education and individual provincial directors of vocational education, to all of whom the editors of SCHOOL SHOP express their thanks.

U.S. Department of Education
7th and D Sts., S.W.
Washington, DC 20202

Office of the Assistant Secretary for Vocational and Adult Education
202/245-8166

Robert M. Worthington, Ph. D., assistant secretary.
Melinda M. Maury, special assistant.

Office of the Deputy Assistant Secretary for Vocational and Adult Education
202/245-2555

John K. Wu, deputy assistant secretary.
Jed J. Richardson, special assistant.
Patricia A.E. Rodgers, special assistant.
Marv C. Hanrahan, special assistant.

Division of Vocational Education Services Office of the Director — 202/472-3440

LeRoy A. Cornelsen, director.
C. Kent Bennion, deputy director.
State Administration Branch — 202/245-2235
Issac Wilder, branch chief.
Leslie L. Thompson, senior program specialist.
Daryl E. Nichols, senior program specialist.
Gloria J. Williams, education program specialist.
Sylvia L. Hinkley, program assistant.
Finance Branch — 202/245-2626
Marcel R. DuVall, branch chief.
Laura G. Johns, education program specialist.
Myrna G. Hugi, education program specialist.
Juliette N. Lester, education program specialist.
Leonard C. Lintner, education program specialist.
Daisy M. Arrington, education support specialist.
Programs and Services Branch — 202/245-9786
Thaine D. McCormick, branch chief.
Occupational Programs Section — 202/245-9786 or 472-9140
William A. Dennis, section chief.
Bertha G. King, consumer and homemaking specialist.
C. Coleman Harris, agriculture program specialist.
James H. Wykle, business program specialist.
Edwin L. Nelson, marketing and distributive program specialist.
Marion R. Craft, senior program officer, cooperative and work study.
David H. Pritchard, senior program officer, guidance.
Cleveland Randle, senior program officer, apprenticeship.
Robert L. Miller, trade and industrial specialist.
Louis Godla, industrial arts program specialist.
Gisela I. Harkin, education program specialist, guidance.
Catherine B. Junge, health program specialist.
Program Development Section — 202/245-9608 or 472-9140
James W. Warren, section chief.
Charlotte Conaway, handicapped/disadvantaged specialist.
Joyce D. Cook, guidance & counseling specialist.
Karen K. Cossaro, program specialist.
Marion R. Craft, cooperative & work-study specialist.
Gisela I. Harkin, guidance & counseling specialist.
Louis G. Mendez, military preparedness specialist.
Cleveland Randle, apprenticeship program specialist.
Winifred I. Warnat, technical program specialist.

Division of Innovation and Development Office of the Director — 202/245-2278

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Duane M. Nielsen, deputy director.
Appalachian Regional Staff — 202/472-5860
George Sanders, chief.
National Projects Branch — 202/245-2614
Muriel S. Tapman, chief.
Richard F. Dicola, program specialist, national projects.
Paul R. Geib, program specialist, national projects.
Kathleen M. Holmberg, program specialist, national projects.
Laura M. Karl, program specialist, national projects.
Program Improvement Systems Branch — 202/245-2617
Glenn C. Boerrigter, chief.
Bernice H. Anderson, program specialist, curriculum coordination centers.
Mary G. Lovell, education program advisor, National Center for Research in Vocational Education.
Pariece M. Wilkins, program specialist, National Center for Research in Vocational Education.
Thomas W. White, program specialist, research coordinating units, program improvement, adult education.
Special Programs Branch — 202/245-2774
John G. Nealon, chief.
Dianne Carter, program specialist, corrections education program.
Ronald Castaldi, program specialist, community education.
Timothy D. Halnon, program specialist, corrections education program.
Robert E. Marshall, program specialist, rural education.
Bernard B. O'Hayre, program specialist, corrections education program.
Harvey Thiel, program specialist, Indian education program.

National Advisory Council on Vocational Education
425 13th St., N.W.
Suite 412
Washington, DC 20004
202/376-8873

James W. Griffith, executive director.

STATE OFFICIALS

(In this portion of the directory, the address for all individuals is listed under the name of the state, except for regional officials whose address follows their names.)

Alabama

Trade and Industrial Education
State Office Bldg.
Room 820
Montgomery 36130
205/832-3347

Charles E. Newton, state specialist.
Randal Peacock, VICA executive secretary.
Earl Ball, district specialist.
Charles F. Tate, specialist, industrial arts education.
202-B Skyland Boulevard
Room 77
Tuscaloosa 35405
205/769-5448
Fred Colburn, district specialist.
J.L. Madison, district specialist.
Lester Landers, district specialist.
Joe Tommie, district specialist.
Erskine Terry, district specialist.
Robert Kimbrell, district specialist.
Bennie Hayes, curriculum specialist.
Grady Elmore, curriculum specialist.
Auburn University
101-A Petrie Hall
Auburn 36849
Dr. Charles D. Miller, industrial arts specialist.

Alaska

State Department of Education
Pouch F, Alaska State Office Building
Juneau 99811
907/465-2824

W. Ray Minge, program manager, career and vocational education.
Karen Ryals, adult continuing education.
Verdell Jackson, curriculum development, career and vocational education.

Arizona

Division of Vocational Education
1535 W. Jefferson St.
Phoenix 85007

John Lange, deputy superintendent and state director, vocational education.
Hoyt Kenmore, education program specialist, industrial arts.
Kenneth Thompson, education program specialist, trade and industrial education.
State Board of Directors for Community Colleges
Wayne McGrath, executive director.
——, associate director, educational services.

Arkansas

Vocational & Technical Education Division
Department of Education
Arch Ford Education Bldg.
Little Rock 72201
501/371-2165

Dr. J. Barry Ballard, director.
Richard Cochran, deputy director for industry training.
Dr. Charles Jackson, associate director.
James Dasher, coordinator, planning & development.
James Shepard, coordinator, instructional programs.
Charles W. Easley, supervisor, trade and industrial education.
Lonnie McNatt, coordinator, vocational technical schools.
Oswald Weise, supervisor, orientation programs.
James Miller, supervisor, general cooperative programs.
Douglas Rush, supervisor, special needs programs.
Jean McEntire, supervisor, technical education programs.

California

State Education Bldg.
721 Capitol Mall
Sacramento 95814
916/445-3314

James T. Allison, director, vocational education.
Jerry D. Jones, industrial education supervisor.
Lawrence A. Garetto, assistant to the director, vocational education.
T. Chris Almeida, program manager, industrial, health, & apprenticeship education.
Central Regional Office
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Sacramento 95814
916/445-9570
William J. Callahan, industrial education supervisor.
Karl F. Jacobson, industrial education supervisor.
Coastal Regional Office
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Oakland 94607
415/464-0955
Paul G. Sciranka, industrial education supervisor.
Southern Regional Office
One Bunker Hill Bldg., Suite 1010
601 W. 5th St.
Los Angeles 90017
213/620-3424
Harry Imura, industrial education supervisor.
Berlin Parker, industrial education supervisor.
Chancellor's Office
California Community Colleges
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Sacramento 95814
916/445-0486
William M. Anderson, director of vocational education.
William Boakes, industrial education specialist.
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John D. Cronin, administrator, employment training.
Paulette Perfumo, administrator, vocational education.
Daniel Estrada, specialist, vocational education.
James Hirschinger, specialist, vocational education.
Rosemary Hovorka, specialist, vocational education.
Ralph E. Matthews, specialist, agricultural education.
Albert Metzler, industrial education specialist.
John Mills, specialist, vocational education.

➡

William R. Morris, specialist, evaluation and research.
Allene Murdoch, specialist, vocational education.
J. Winston Silva, specialist, criminal justice education and training.
Rebecca Singleton, specialist, business education.

Colorado

1313 Sherman St.
Centennial Bldg.
Denver 80203
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Dorothy Horrell, associate director, occupational education division.
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Norm Tilton, program manager, manufacturing & trades.
Art Thomas, assistant program manager, manufacturing & trades.
Richard Zimpel, program manager, high technology programs.
Carol J. Vote, equity coordinator.
John W. Lacey, M.I.S. coordinator.
Donald McInnis, director, community college division.
James L. Harris, director, state occupational information coordinating committee (SOICC).
Dale McCall, executive director, state advisory council for vocational education (SACVE).

Connecticut

P.O. Box 2219
Hartford 06115
203/566-4868

Associate Commissioner's Office

Clarence M. Green, associate commissioner/director.

Bureau of Program Planning and Development

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Carole C. Aiken, education consultant, sex equity.
Judith Thompson, education consultant, data and information systems.
Barbara V. Lownds, consultant, planning research, exemplary and curriculum.
William Choquette, research analyst II.

Bureau of Youth Employment and Training Services

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Carl L. Pawloski, program development.
David A. Pascucci, program development.
Harry Peters, education consultant, program development.

Bureau of Vocational Services

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Charles Bertagna, education consultant, curriculum and program coordination.
David Gifford, education consultant, handicapped and disadvantaged.
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Edward Shia, education consultant, trade and industrial education.
Stephen Hoag, VICA Youth Club.

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Beatrice Tinty, educational consultant, legal, guidance, and affirmative action.
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Maxine Arkin, associate educational consultant, special education.
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Gene Tanasi, chief of engineering services.

Delaware

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P.O. Box 1402
Dover 19903
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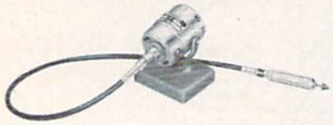

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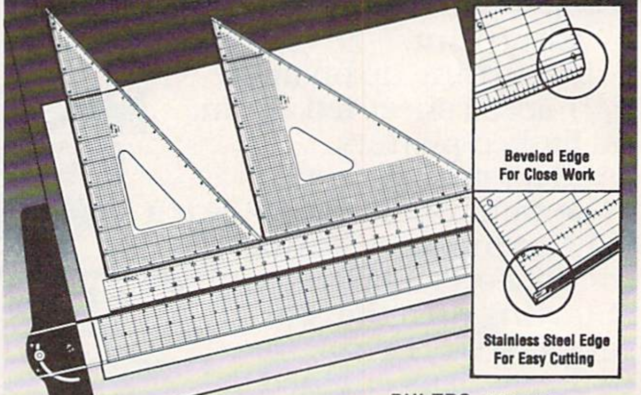

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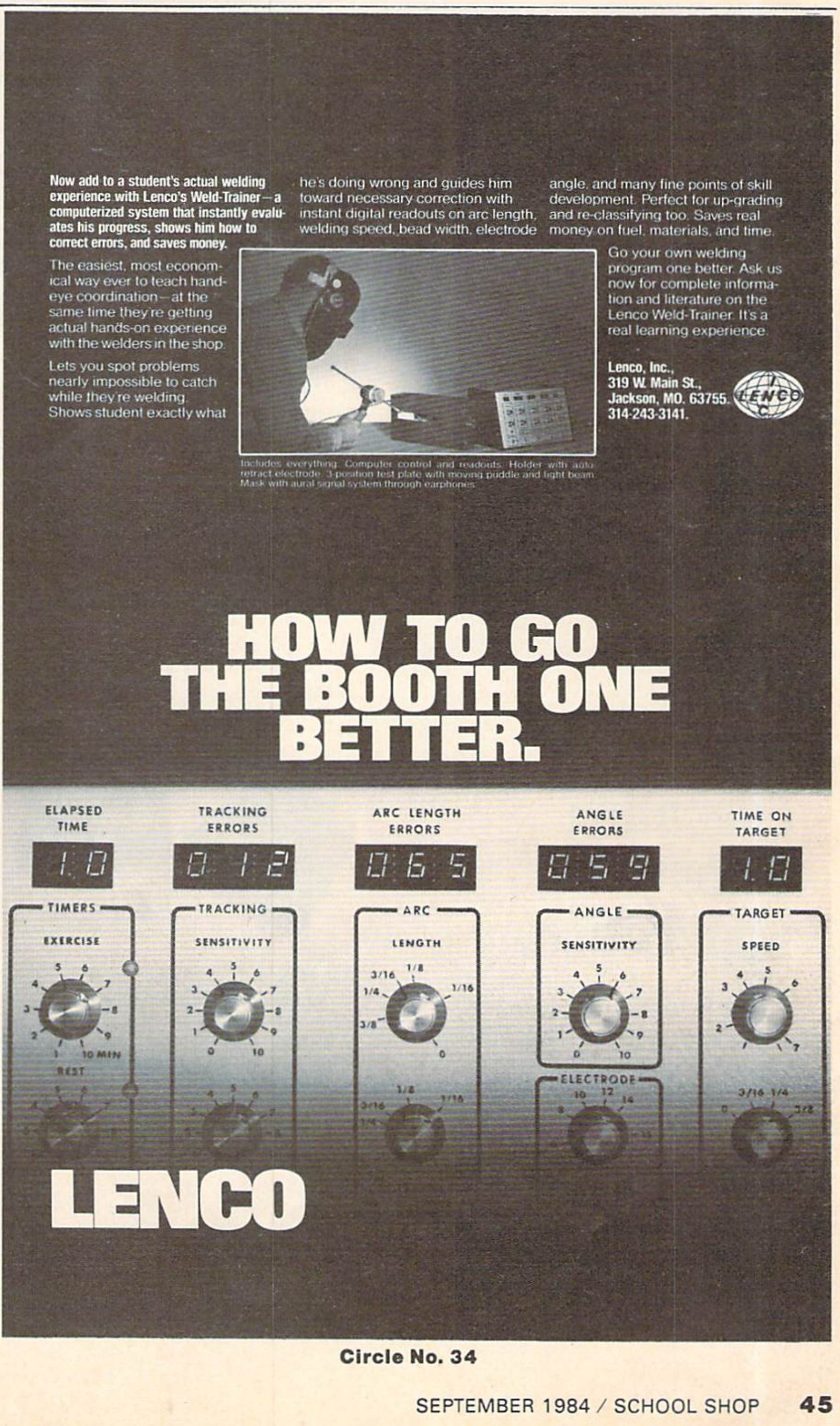
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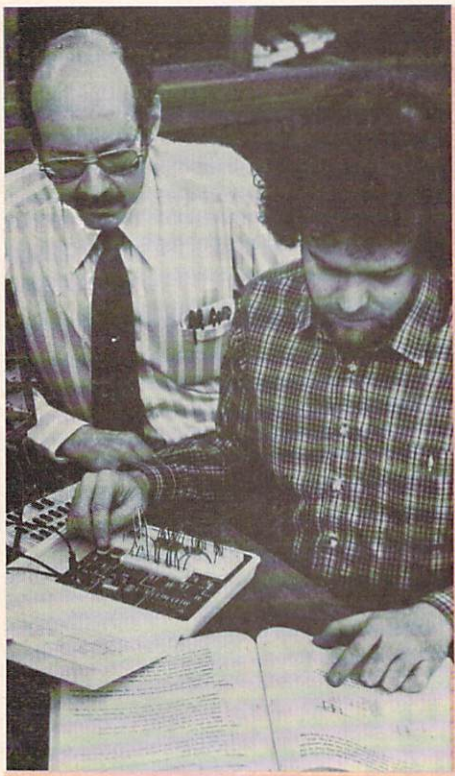

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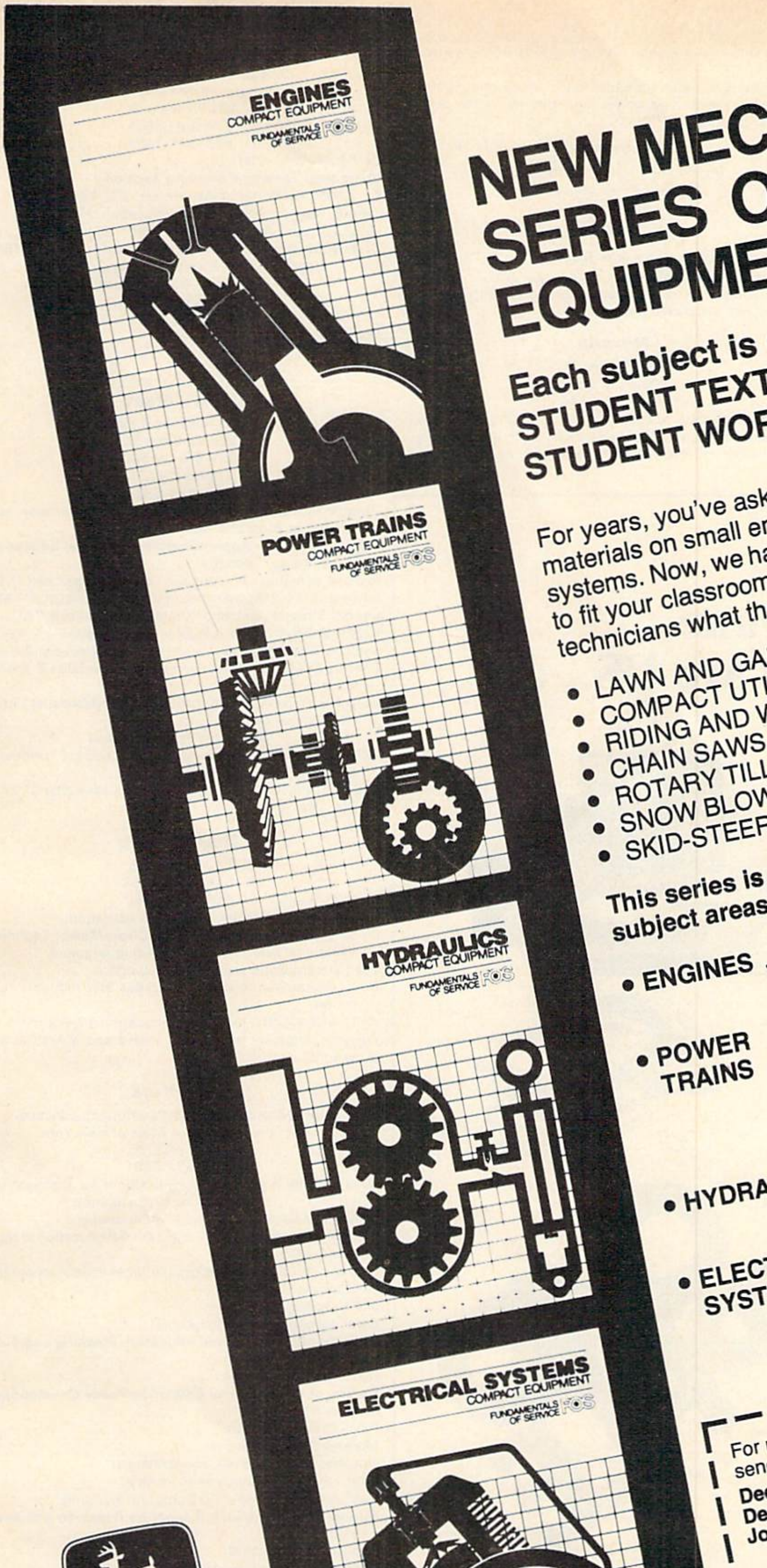
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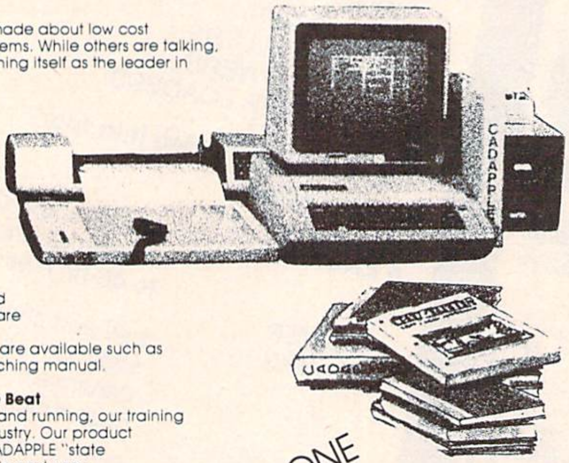

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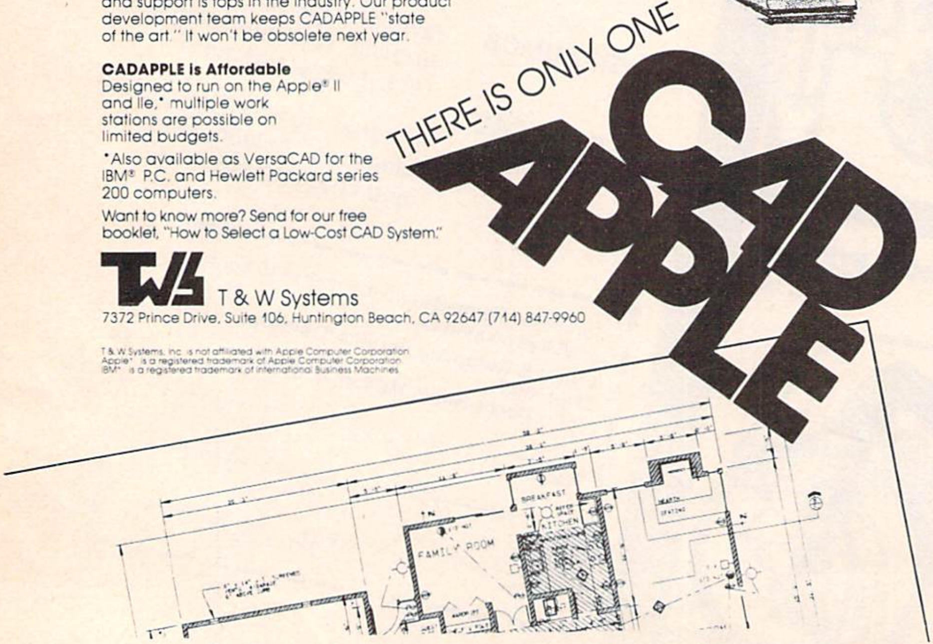

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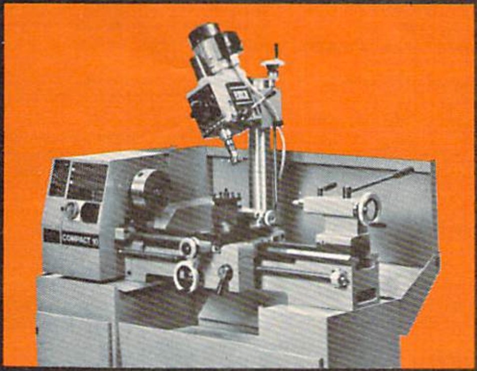

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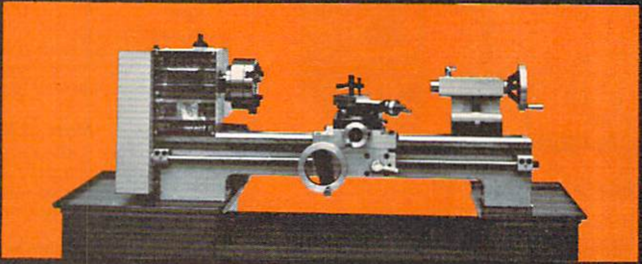

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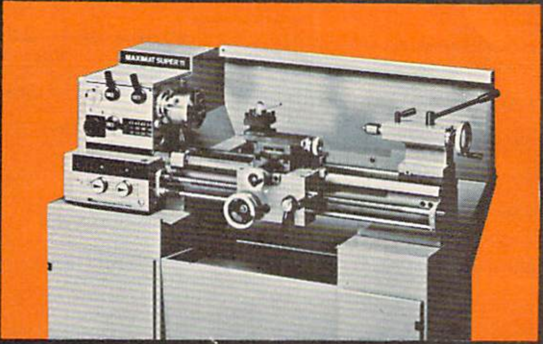

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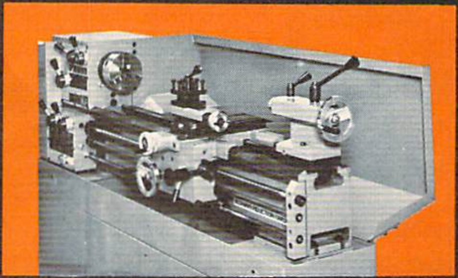

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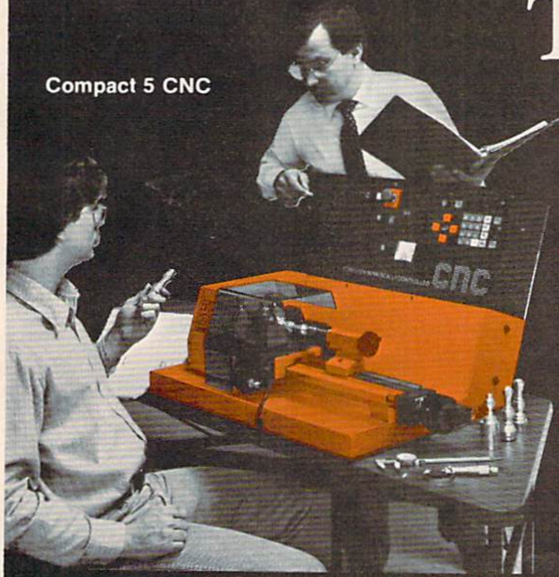

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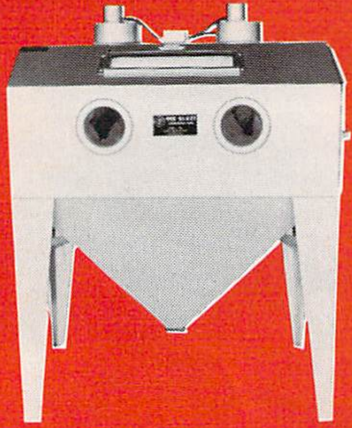

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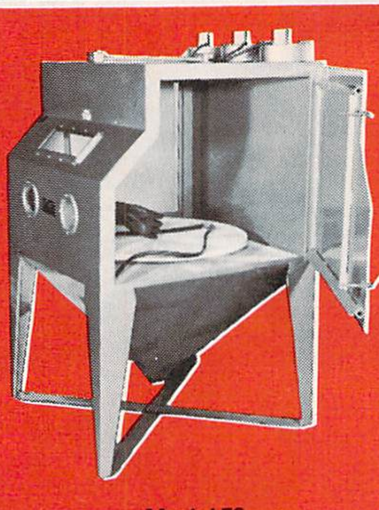

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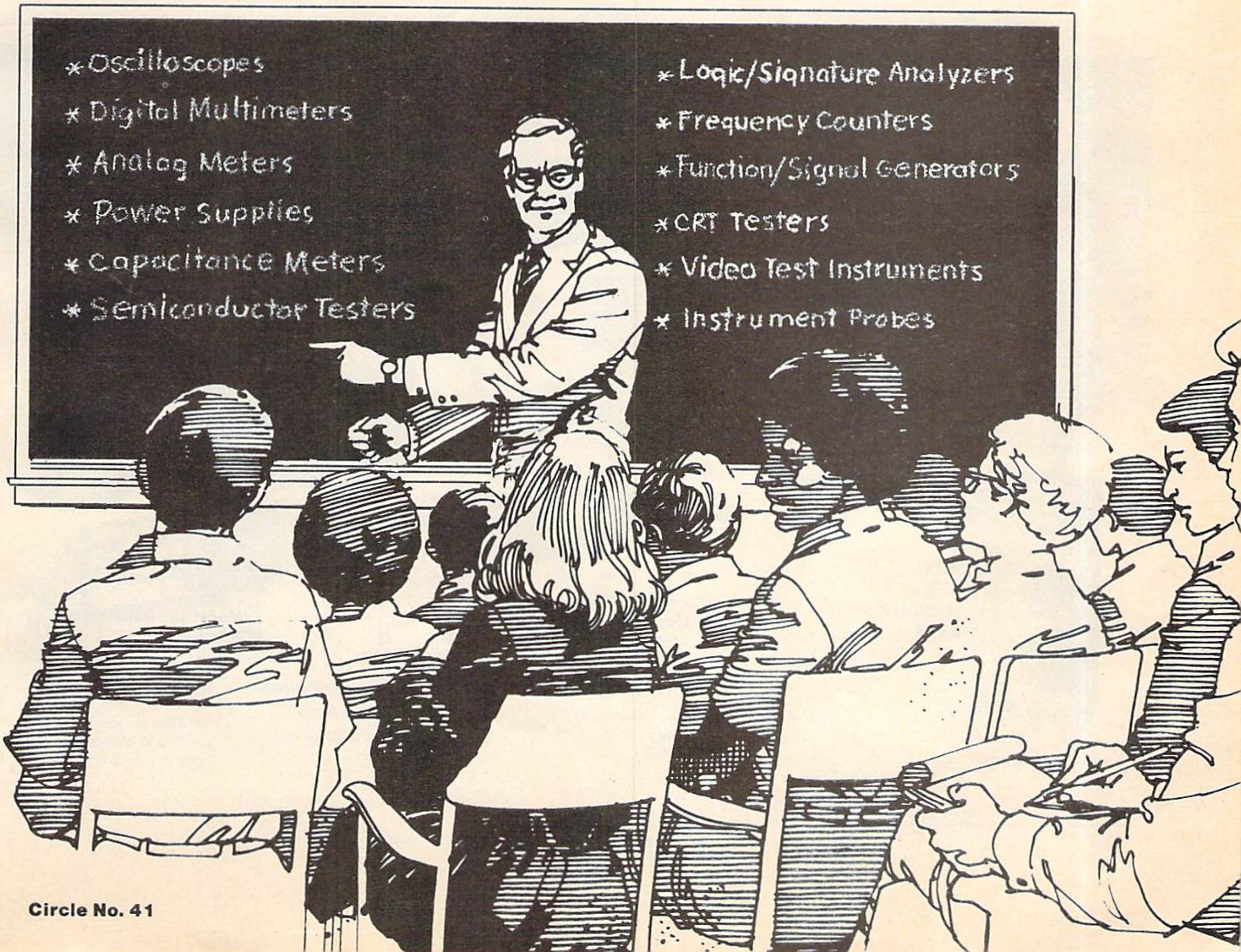
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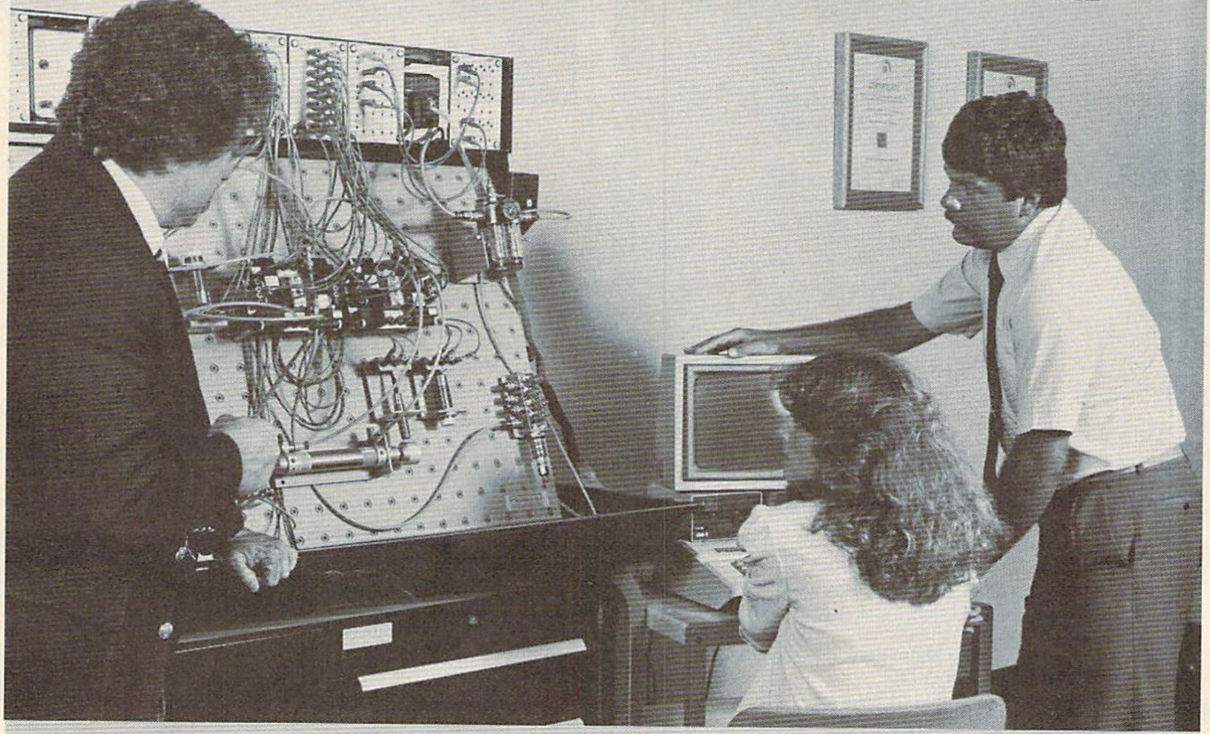

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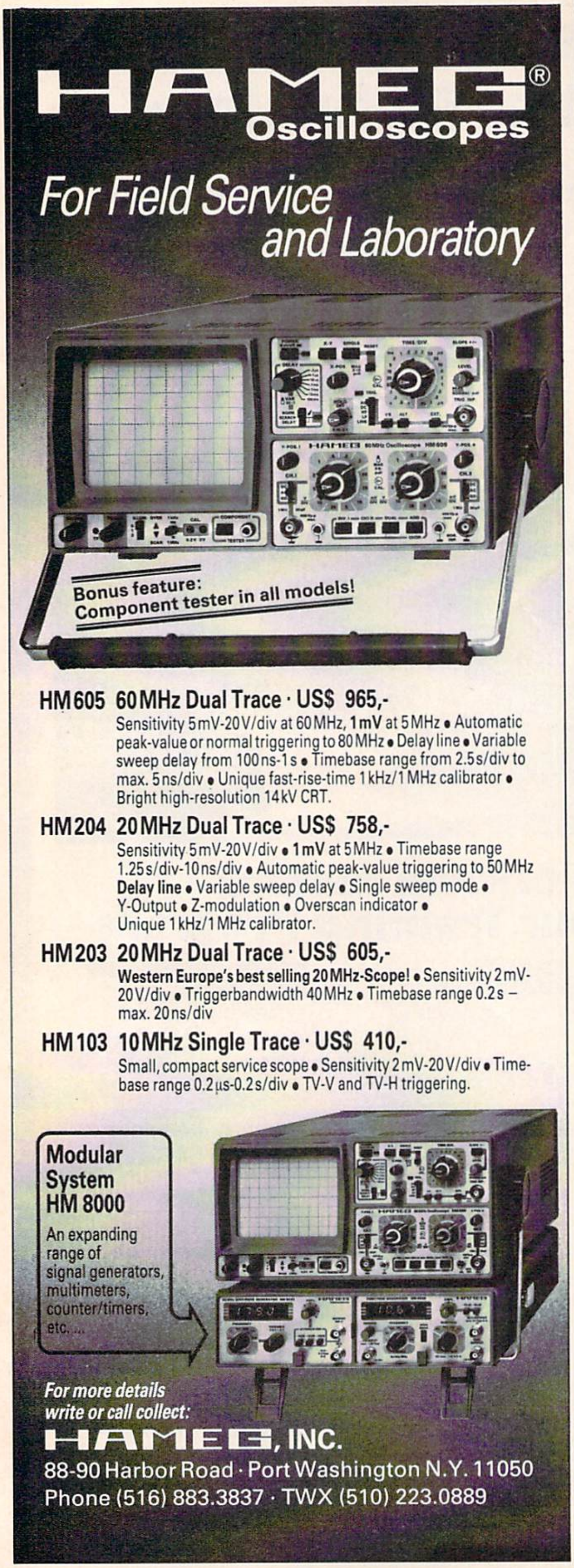

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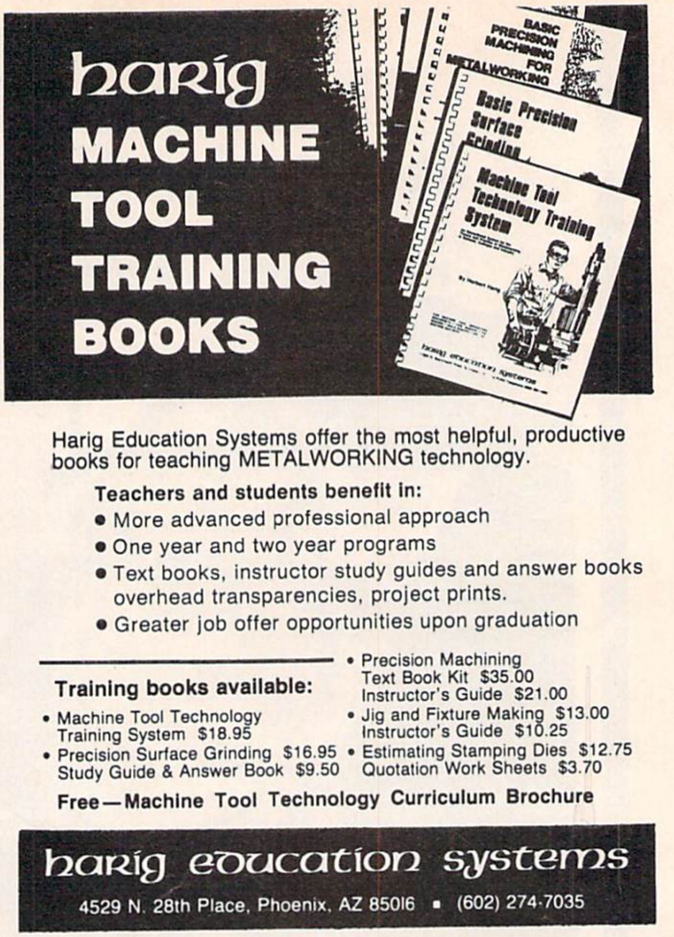

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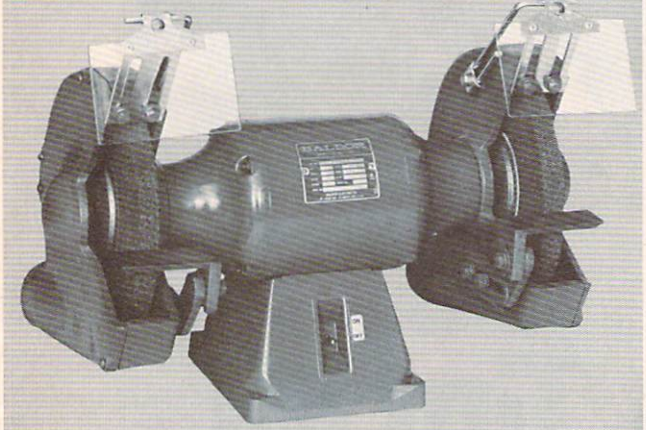

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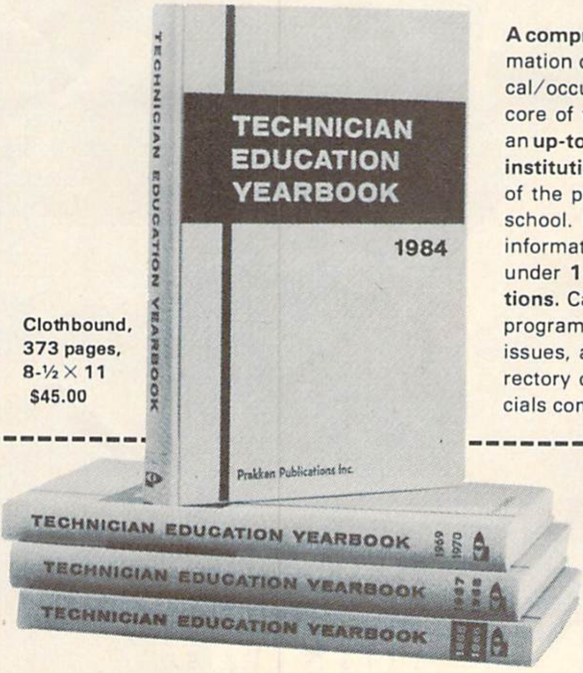
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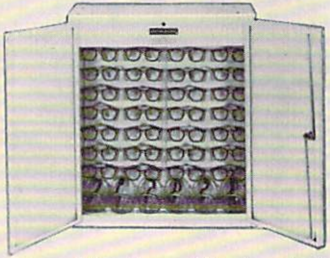

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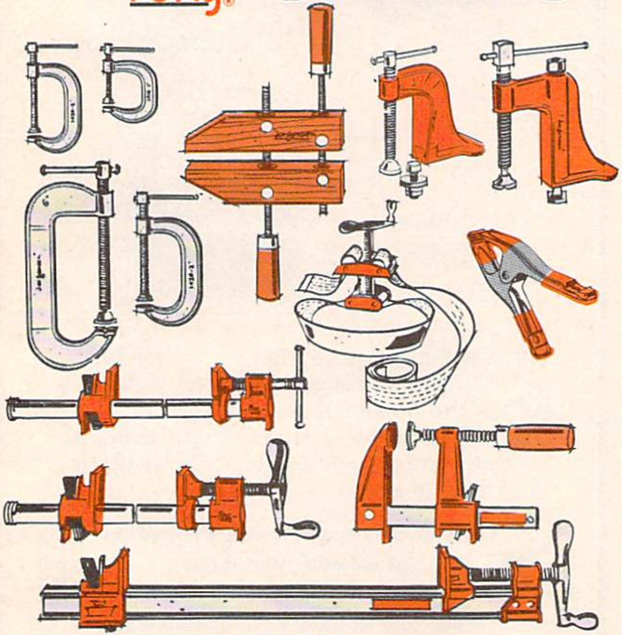

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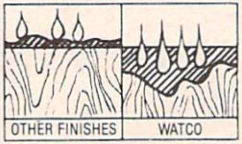

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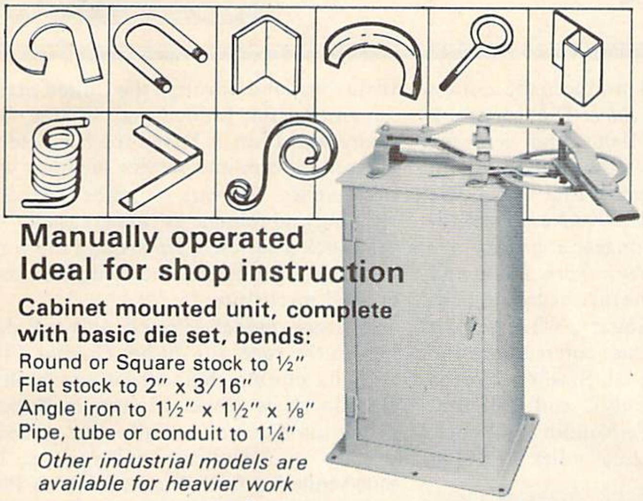

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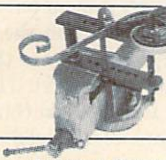

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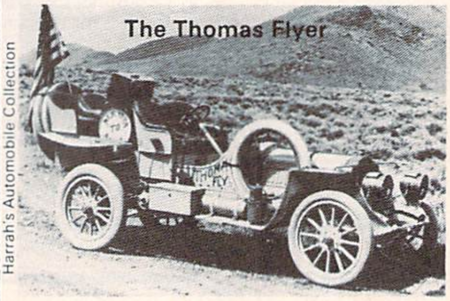
Technology's Past

The Great Race

IN 1965, Hollywood produced the motion picture *The Great Race*. The story took place in the early 1900s and centered around a road race from New York to Paris. Few people realize that this movie was based on an actual 1908 New York-to-Paris road race, the longest in history.

Sponsored by the *New York Times* and the *Paris Le Matin*, the race began on February 12 in Times Square, witnessed by 250,000 people. The cars entered were the Thomas Flyer (United States), Protos (Germany), Zust (Italy), and DeDion, MetoBloc, and Sizaire-Naudin (France).

The race covered 22,000 miles, 13,341 of them over land, through the United States, Japan, Russia, Manchuria, Siberia, Germany, and France. Paved roads outside of cities were rare and service facilities were miles apart. The cars were not as smooth running and reliable as cars are today—to take such a car on a trip around the world took courageous and knowledgeable drivers and mechanics.



The Thomas Flyer

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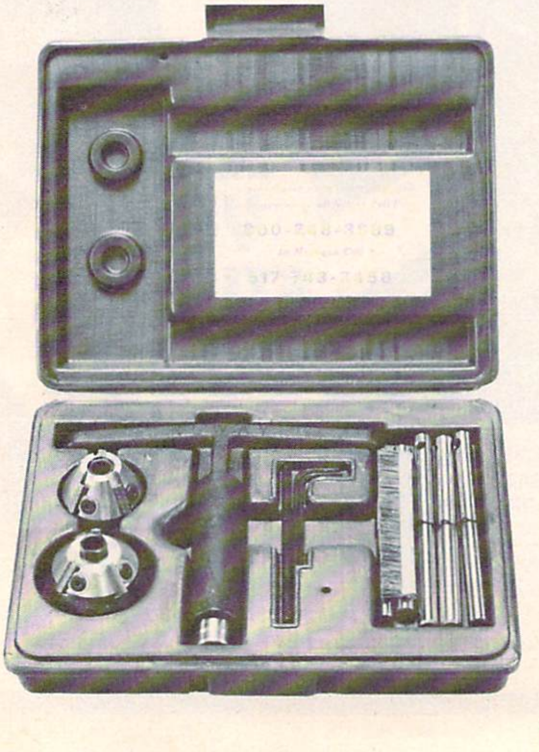

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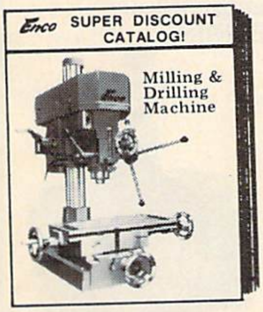

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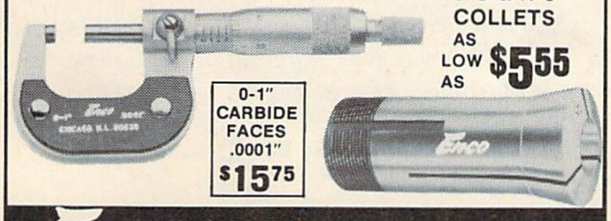

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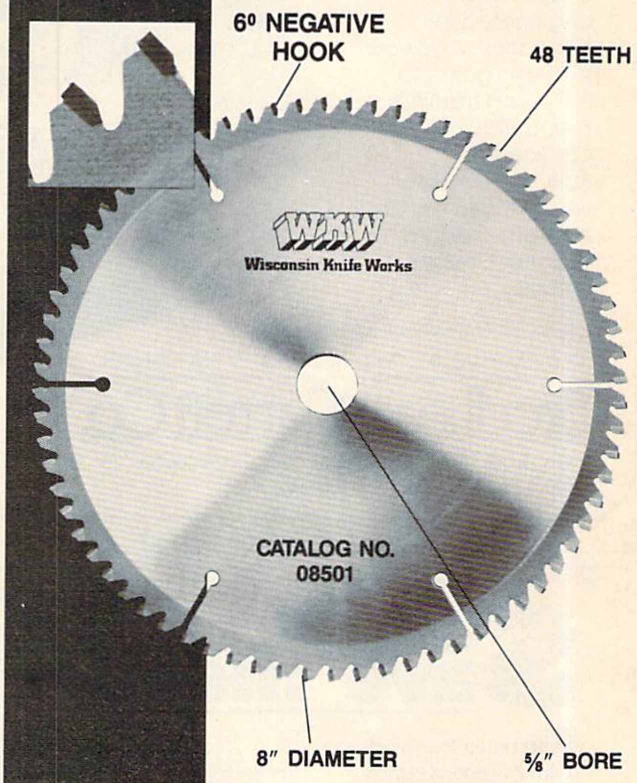

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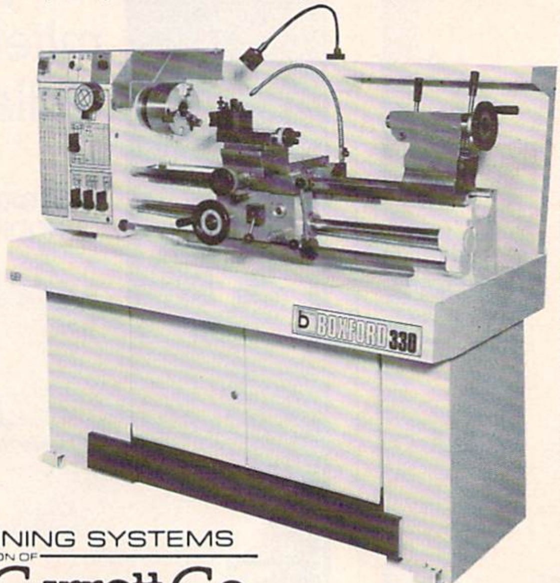

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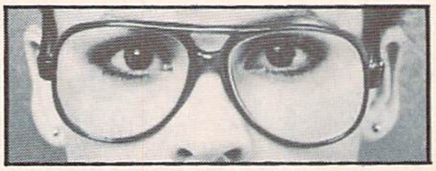

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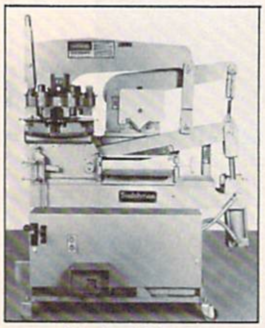

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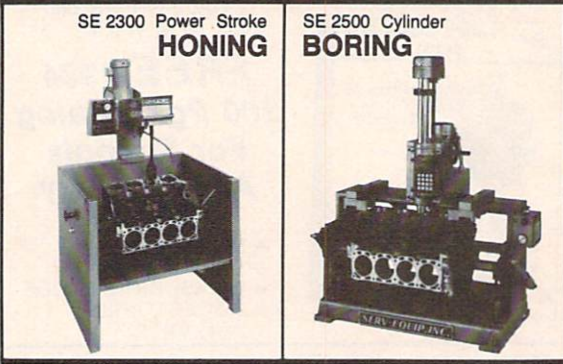

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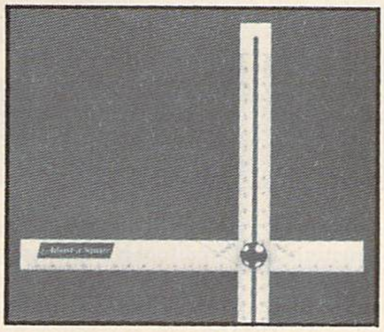

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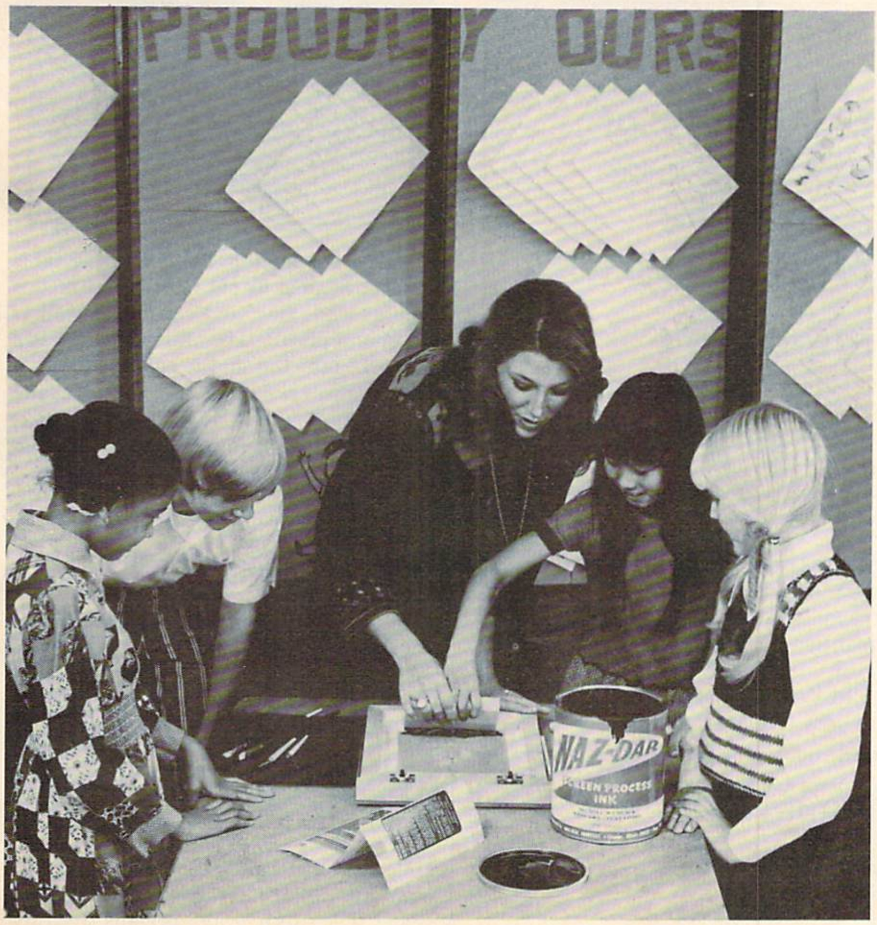

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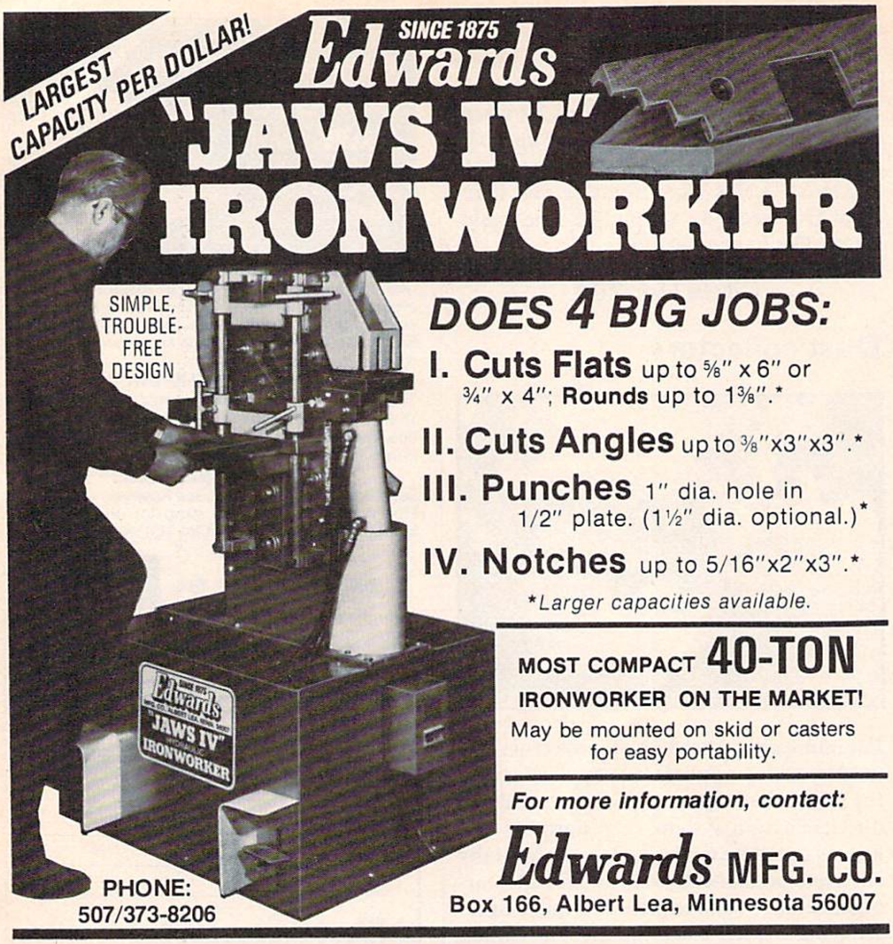
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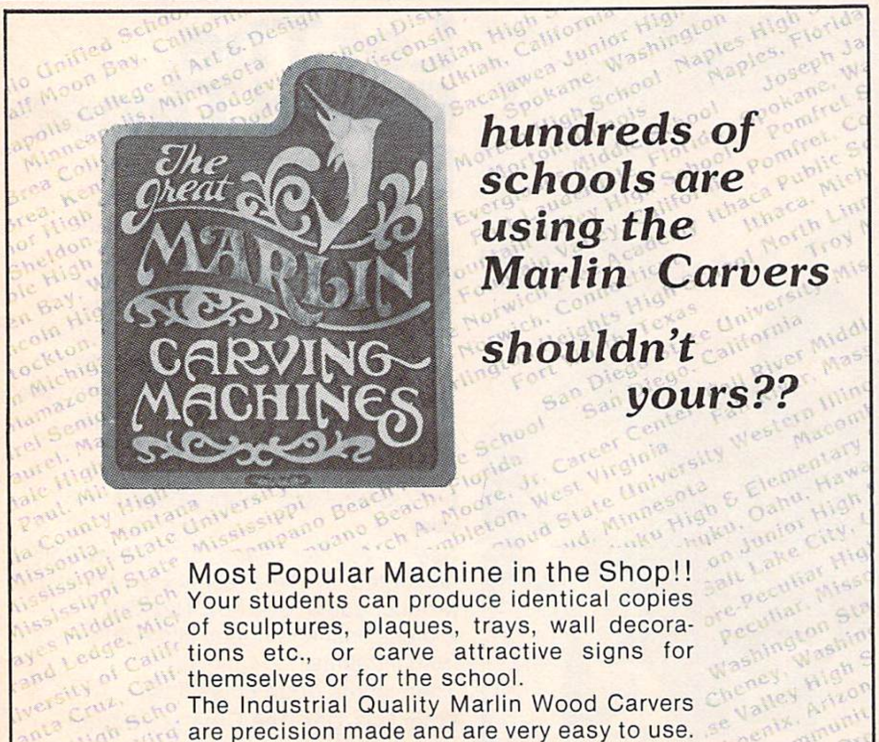
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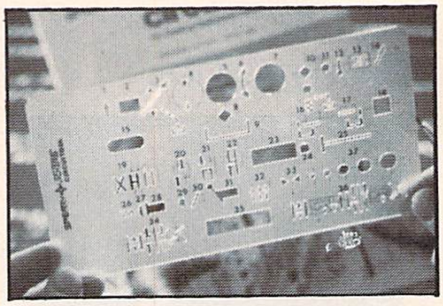

An excellent training aid for fluid power instruction, the Circuitool is a time-saving template that allows the user to draw hydraulic circuit diagrams quickly and accurately. The template reproduces basic ANSI standards for fluid power symbols, components, and circuits. An instructional booklet is included. From Vickers, Inc.

Circle No. 206

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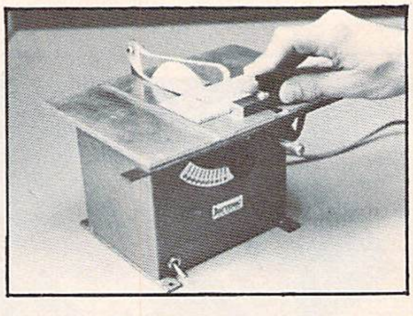

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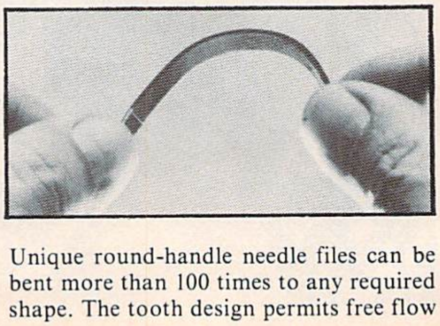

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#0	8"	4½"	15.97	9.95	53.75
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LU84M011	Combination	10"	50	74.51	40.00
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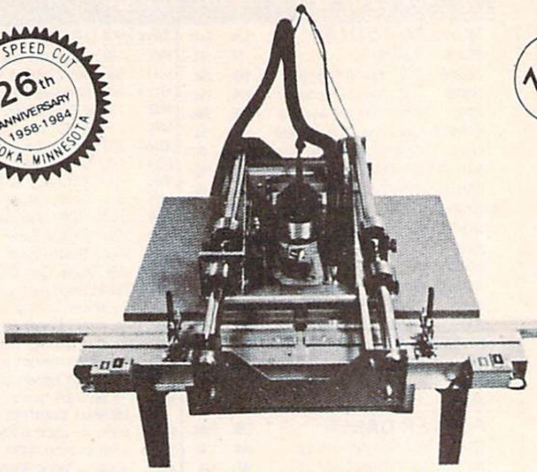

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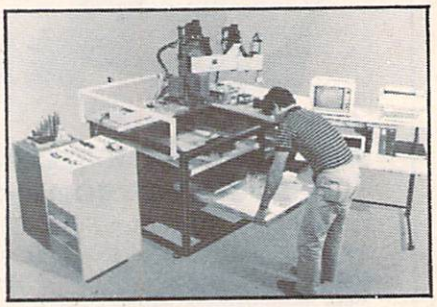

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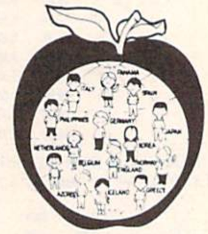

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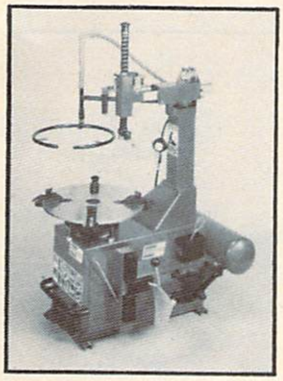
computer with 128 K, a work table, manuals, plus tooling, fixtures, and parts feeders. From Technovate, Inc.

Circle No. 209

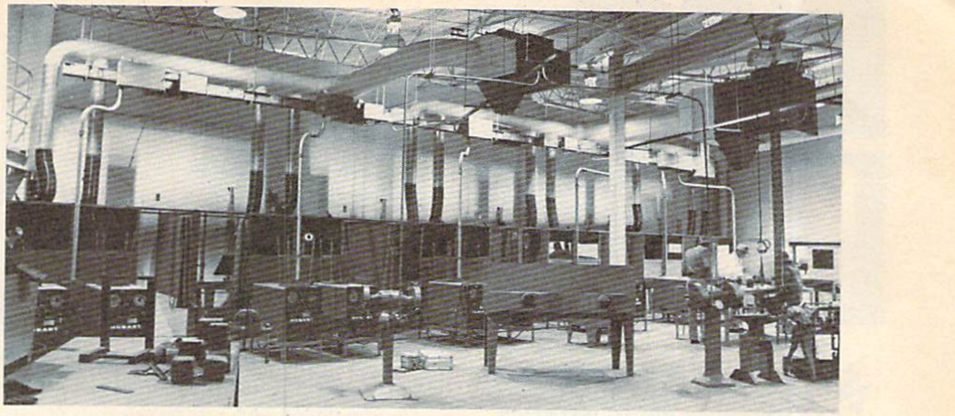
Tire changer



Model 740 tire changer can handle all domestic and import wheels, even if they have very small or no center holes. The changer has special "kid glove" chuck jaws, replacing the standard center post/locking cone method of securing the tire. The chuck jaws lessen the possibility of damage to mags, wires, chromes, aluminum, and other specialty wheels during changing operations. From Ammco Tools, Inc.

Circle No. 210

➡



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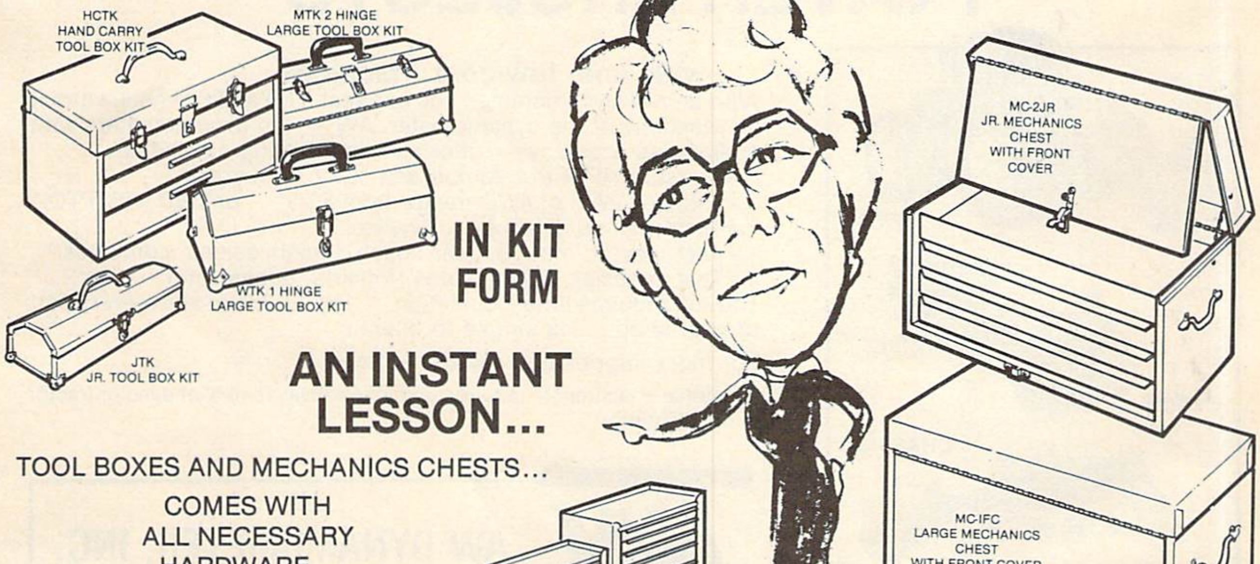
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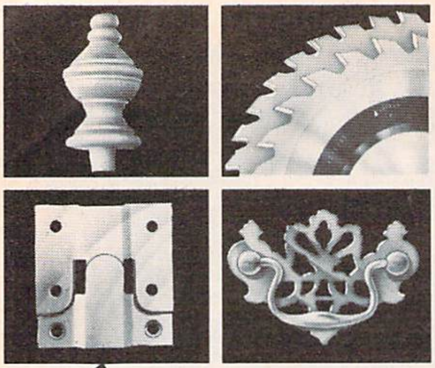

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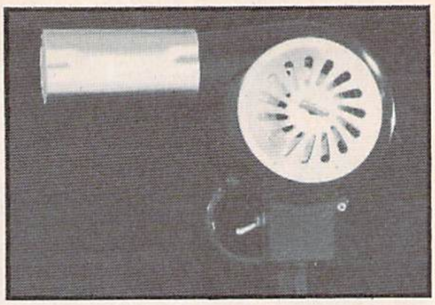
Heat gun



Improved flameless heat gun can be used to speed gluing and finishing operations in woodworking and to dry printing proofs, negatives, opaquing, and rubber cement faster in graphic arts, among other applications. The simple-to-use gun uses 120 ac current and provides 750° of concentrated heat. Lighter than other industrial-quality heat guns, it has a virtually unbreakable electric heating element core of mineral mica. From Milwaukee Heat Tools, Inc.

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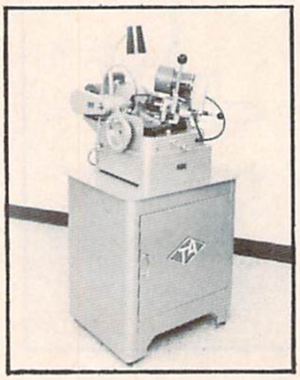
Valve refacer



The Model VR-6500 Valve Refacer is ideal for accurate, safe grinding of engine rebuilding projects. Grinding is done on the side face of the wheel, keeping the number of feet of grinding surface constant to assure uniform finishes, greater accuracy, and safe use. It employs a grinding fluid that is matched with the grinding wheel. From Tobin-Arp Mfg. Co.

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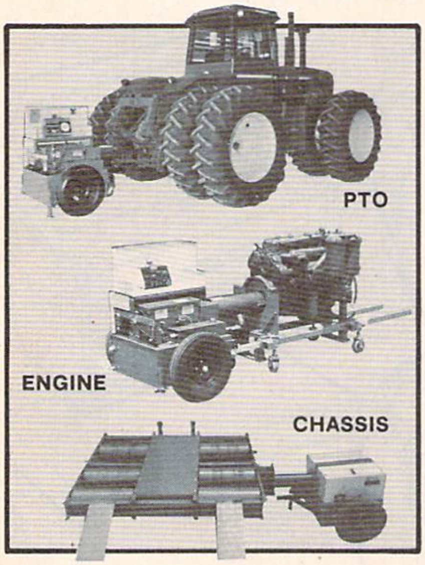

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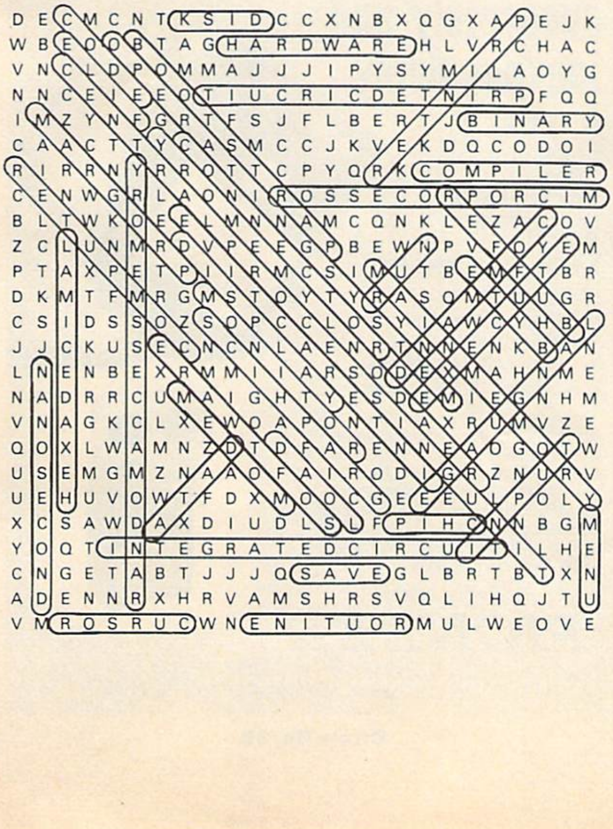
Answers to the computer terms word search on page 34.



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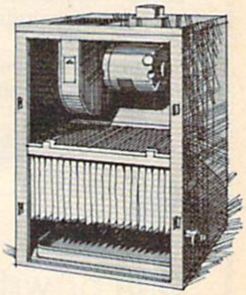
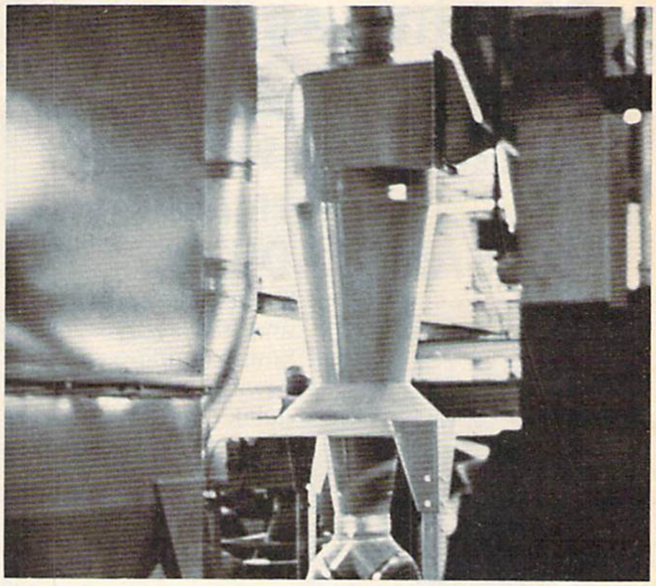


For complete specifications and installation details, look for your Torit sales representative in the Yellow Pages under Dust Collectors. Or write us, Donaldson Company Inc., Torit Division, Box 1299, Dept. 14157R1, Minneapolis, MN 55440.



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Product Literature

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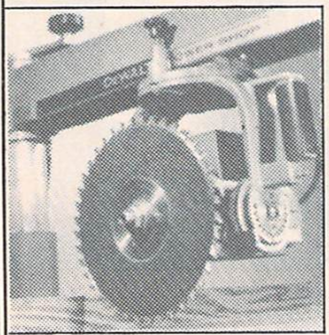

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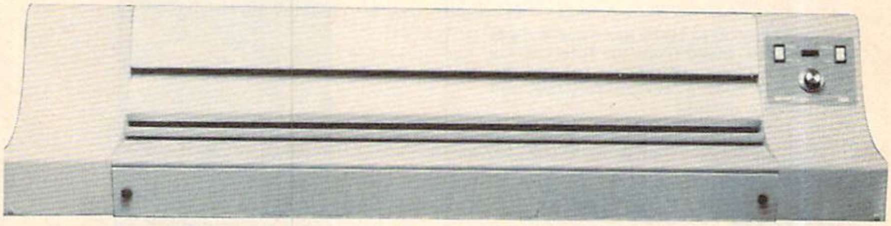

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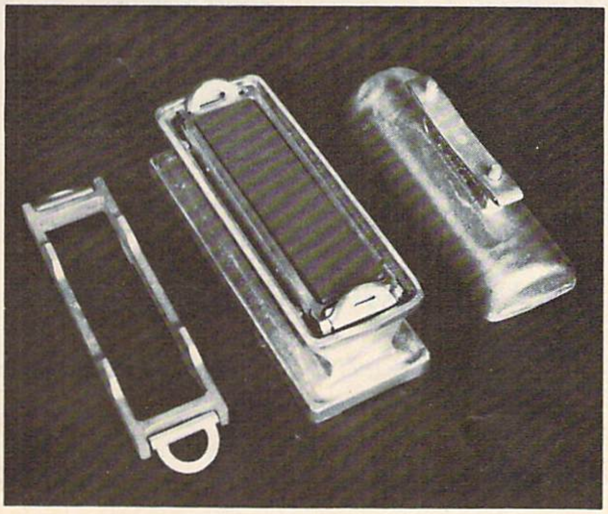

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Circle No. 218

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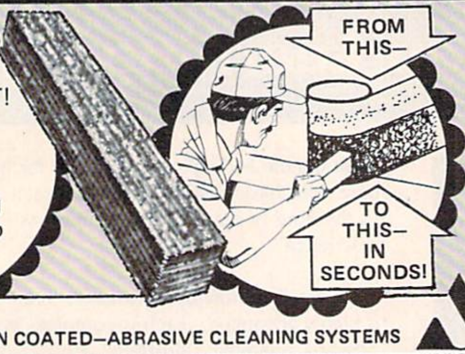
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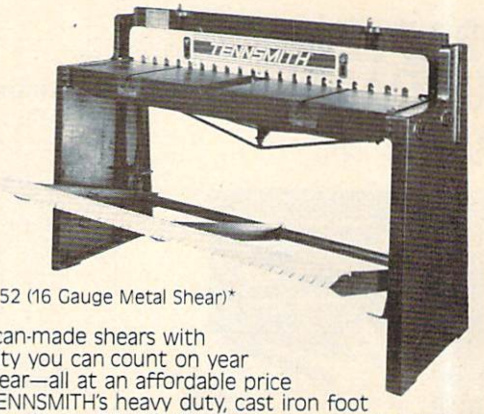

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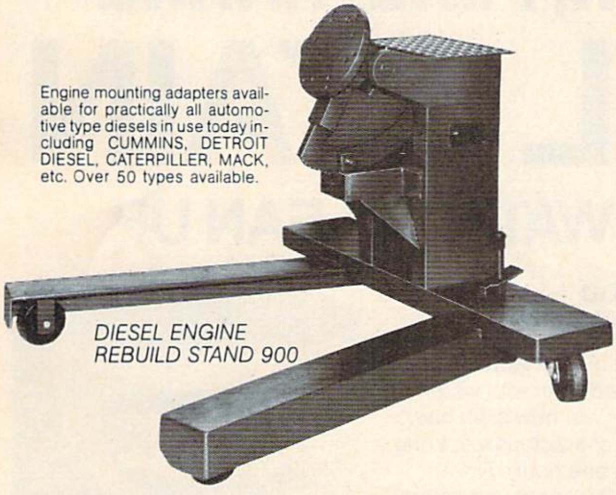

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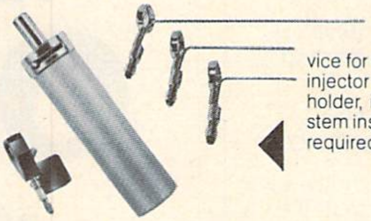

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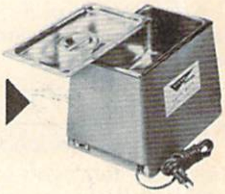

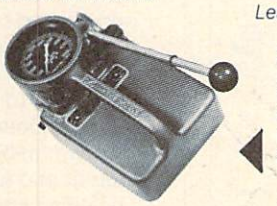

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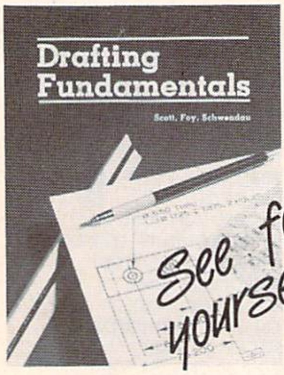

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plus indexing tables. Catalog gives detailed information on overall dimensions, shipping weights, table diameters, lengths of travel, keyway and slot designs, and prices. From Palmgren Products.

Circle No. 220

Airbrushing materials

Eightieth anniversary catalog features several new products for airbrush work—Excel airbrush sets for finely detailed work, larger-size pressure tank, books, opaque airbrush colors, coil hose, and larger LCT tank. Many other items are also described. From Paasche Airbrush Co.

Circle No. 221

Band-saw blade information

OLSON
band saw blades

Helpful "how-to's" for band-saw blade users are included in six-page catalog, OL-35. The catalog tells how to choose the right width, length, tooth style, and teeth per inch, plus other helpful information. The catalog also describes the company's hard-edge flexible-back blades, spring steel blades, bench-top band-saw blades, furniture band-saw blades, and wood-, metal-, and plastic-cutting blades. From The Olson Saw Co.

Circle No. 222

Air tools

Four-page brochure features line of air tools for welding, metal fabrication, and construction applications. It contains information on vertical and horizontal grinders, die grinders, air saws, right angle grinders, scaling and chipping hammers, and rammers. Photos and specifications are included. From T. C. Service Co.

Circle No. 223

Welding, shop furniture

Product planning catalog illustrates equipment manufactured to meet the special needs of welding, automotive, and small engine programs offered by schools. The furniture is fabricated of heavy-gauge steel with welded construction to be durable and practical. Items can be customized to meet particular needs. Lab planning information is included. From Greene Mfg. Inc.

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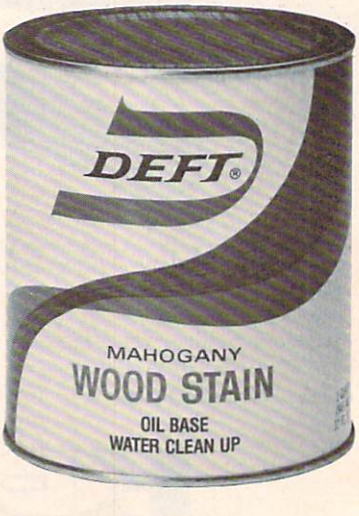

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Art projectors

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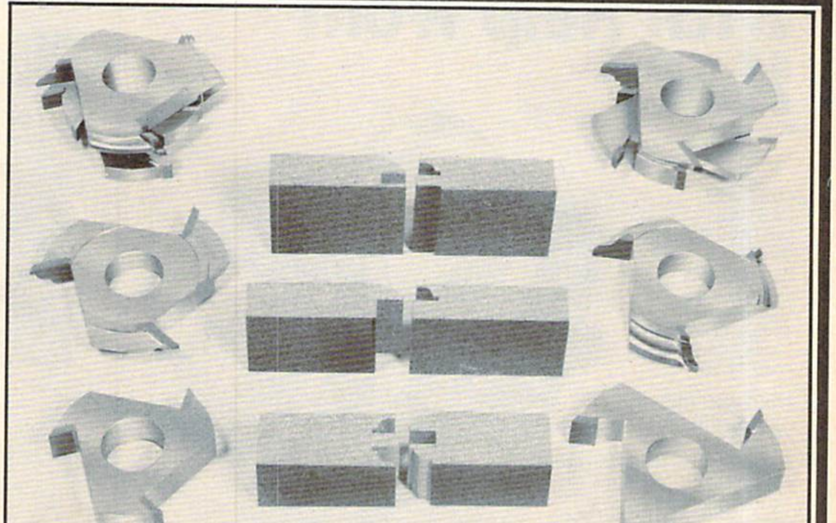

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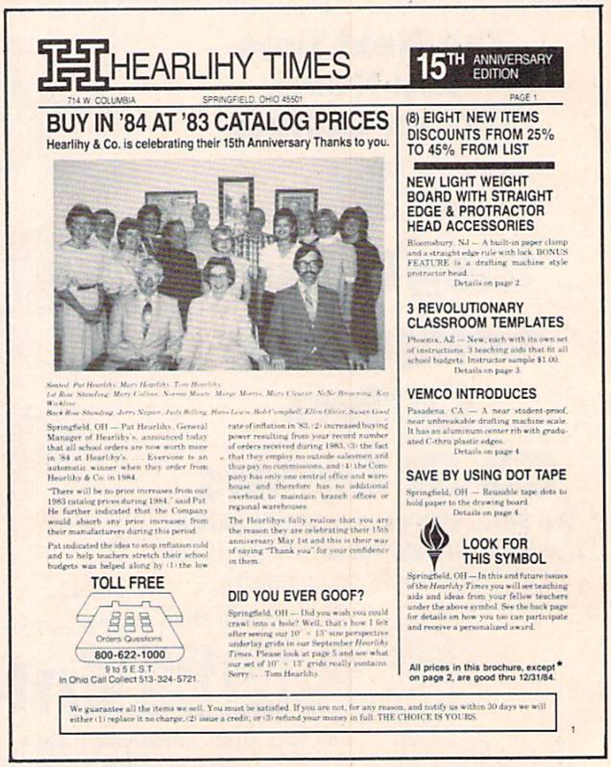

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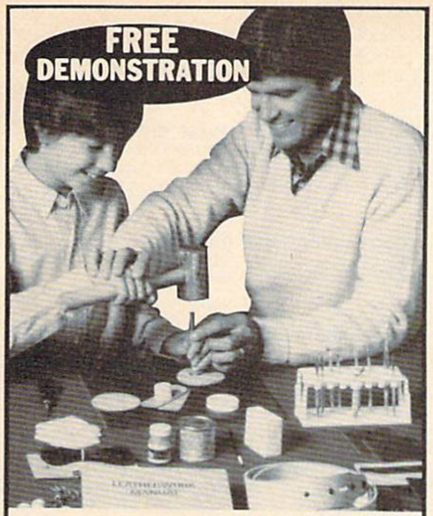

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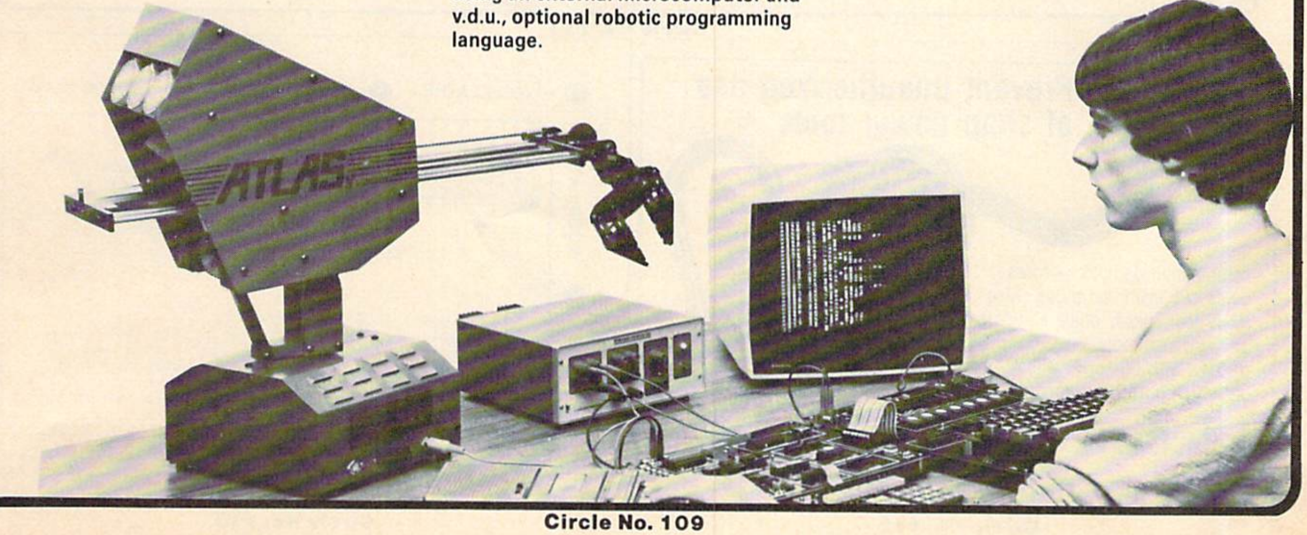

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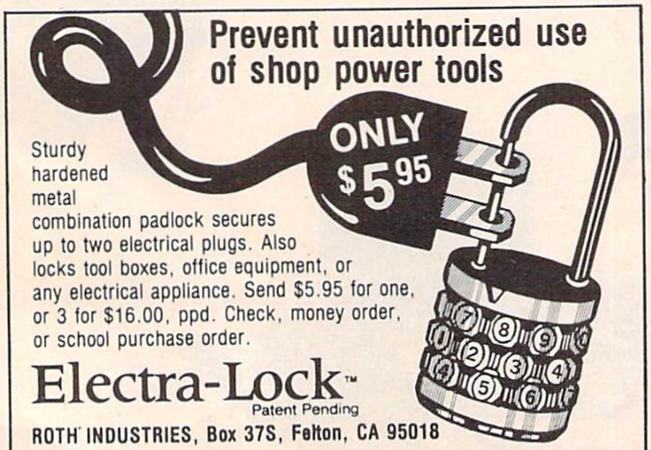

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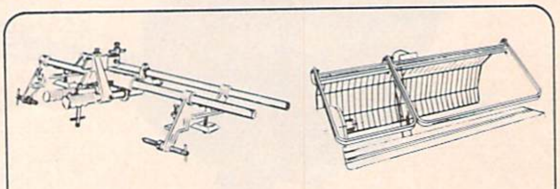
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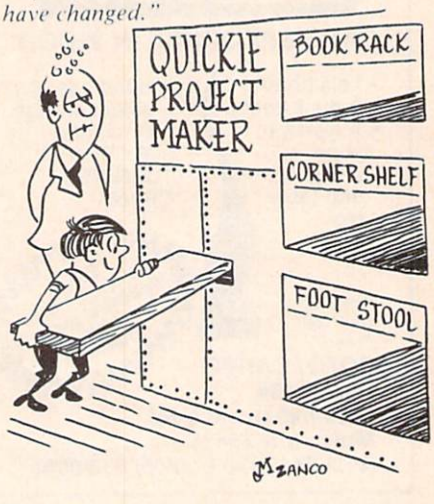

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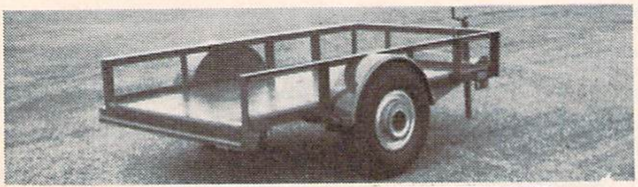

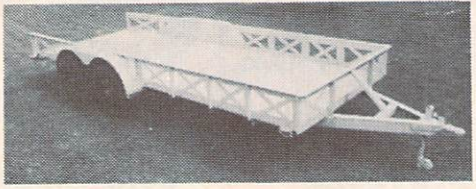

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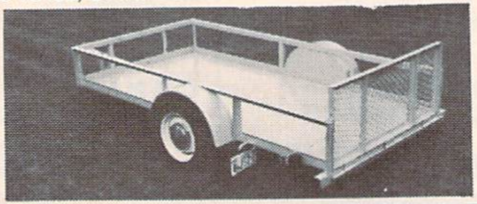

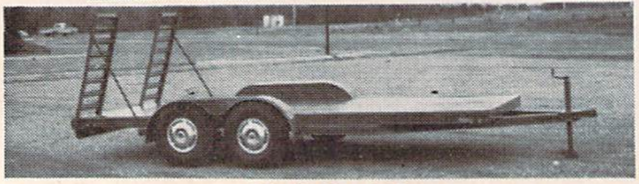

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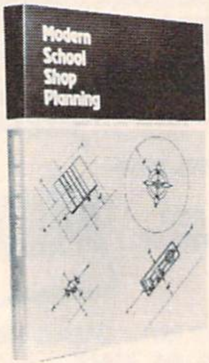

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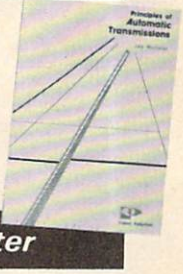

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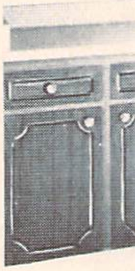

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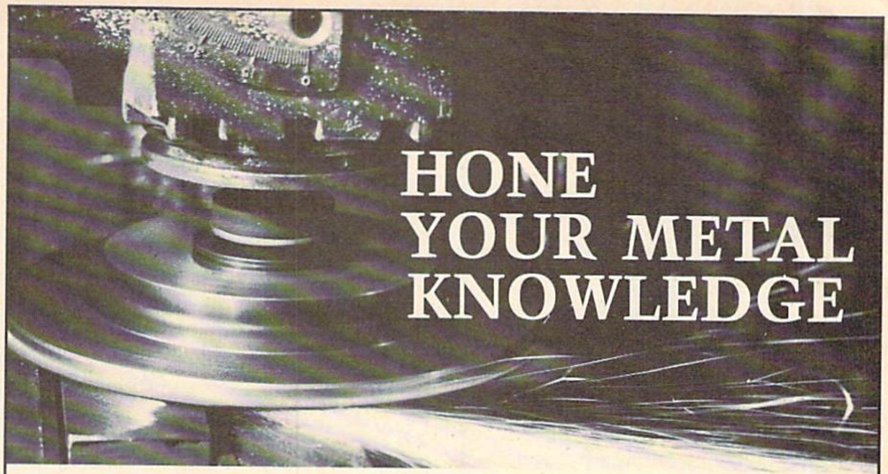

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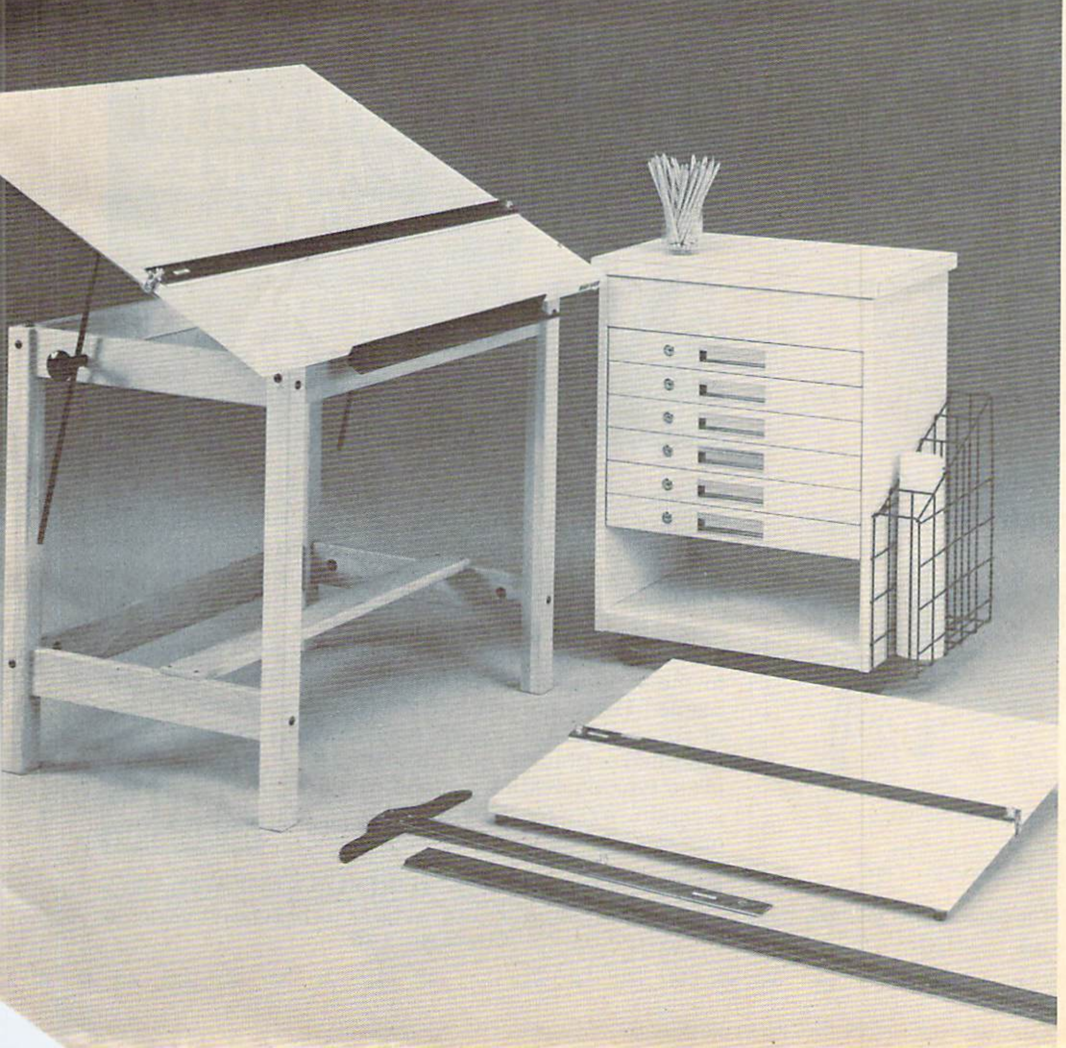

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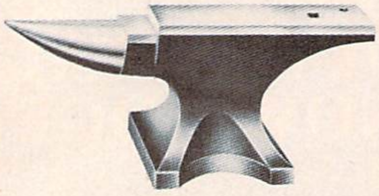

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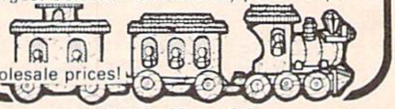
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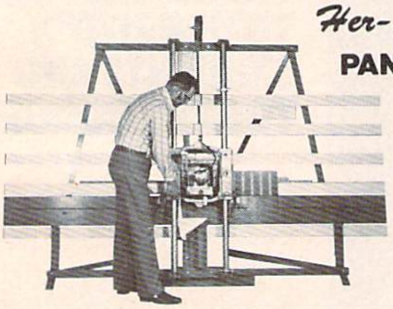

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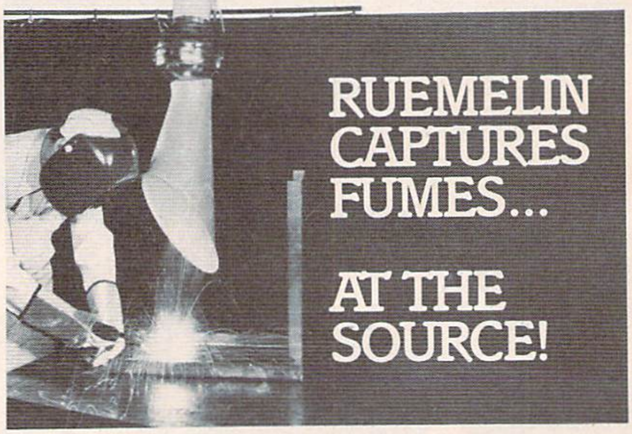

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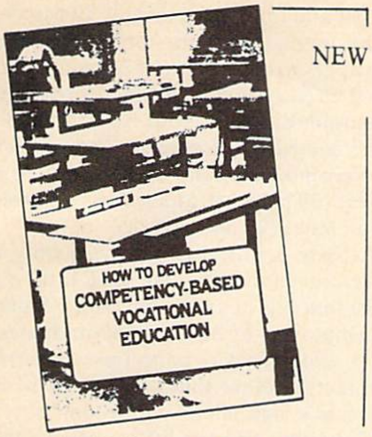

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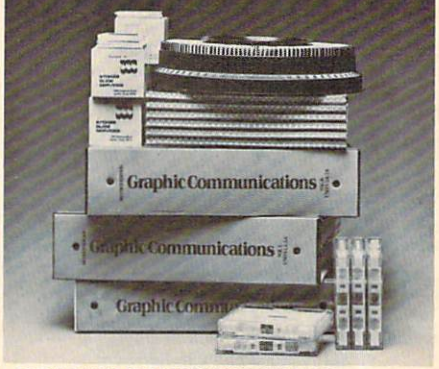

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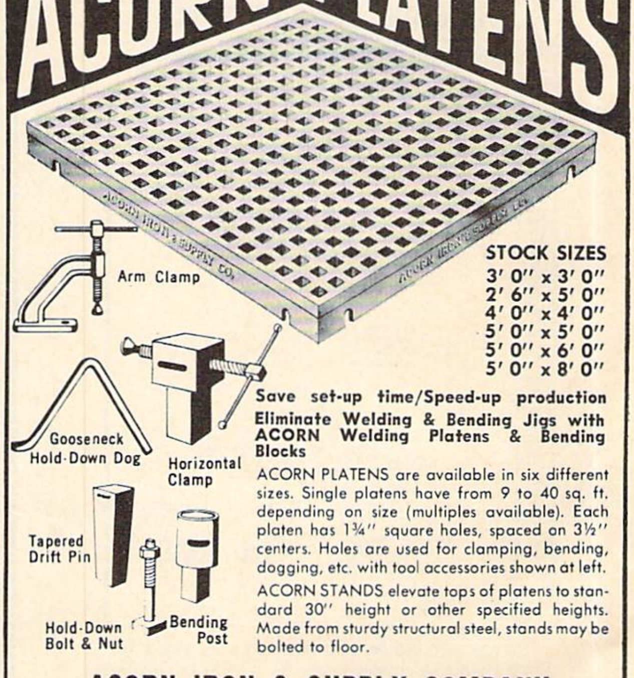

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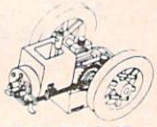

Circle No. 147

WASHINGTON, from page 92.

A different kind of report. Yet another recent report disputes the notion that educational improvements will make much difference, at least as far as employers are concerned. The current push for improvements in American high school education doesn't have much interest for employers, according to a survey of more than 4,000 personnel managers and employers. Ninety-four percent said dependability was the most important characteristic they want in hiring high school graduates. "This means they're looking for an employee who will come to work regularly and on time," said Robert Crain of Johns Hopkins University, whose Center for Social Organization of Schools conducted the survey.

Second to dependability was attitude toward work and supervisors, which 82 percent of the managers cited as very important. Following were ability to get along with others (74 percent) and the ability to read materials at the level of a daily newspaper.

Educational achievements were down the list. Little more than half—56.5 percent—cited the ability to perform basic math computations as extremely important. Only 22 percent said it was vital that graduates be able to read complex materials, while less than 11 percent said the same about handling complicated numerical calculations. High scores on written tests were considered important by 18 percent and top grades by only 12 percent.

The employers were more concerned about personal impressions in an interview (listed as very important by 76 percent), recommendations from someone else in the company (56 percent), complimentary recommendations from previous employers (39 percent), and letters of character reference (27 percent).

"If there is a decline [in the quality of American education], we find little evidence that it is of great concern to American employers of high school graduates," Crain said. "They're concerned primarily with factors other than the quality of an applicant's high school education."

"Certainly, there is little evidence that employers need high school graduates with trigonometry, calculus, physics, chemistry, foreign languages, or the skilled ability to comprehend literature," the report said. "This survey does show that employers do wish the schools would teach basic math and basic reading skills to every student."

Jobs and school. Could a job keep kids in school? And would it have any effect on their job success later? The federal government tried to find the answer to these questions in a study of its $240-million Youth Incentive Entitlement Pilot Projects (YIEPP).

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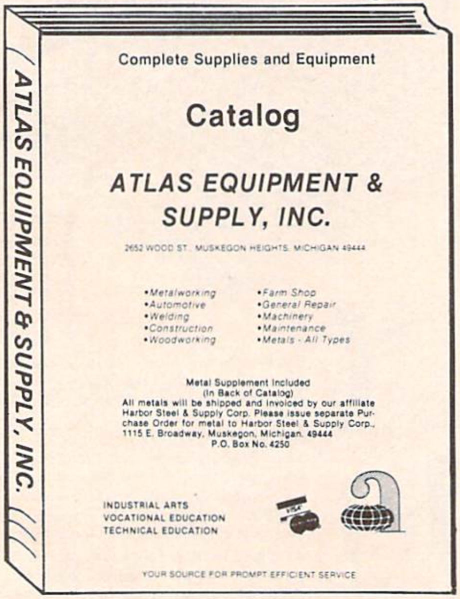
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the school year and a full-time job during the summer if they agreed to stay in or return to school. About 76,000 youths signed up for the program.

But the results of the study were mixed and are likely to play an important role in determining what Congress does to address the problems of youth unemployment. One bill under consideration would begin a similar program, and another would allow companies to pay youths a subminimum wage, a plan pushed by the Reagan Administration but opposed by many who say adults will lose jobs to kids because employers could save money.

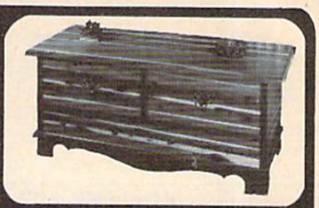
The YIEPP study found the project was an aid in helping the young people earn more money later on. The participants showed average earnings ranging from $10.48 to $14.36 more per week than their counterparts who had not taken part in the program. The participants also were more likely to be employed later on in life than those who were not a part of the experiment, suggesting, the study said, that "exposure to the world of work through participation in YIEPP or similar programs may change a youth's attitudes toward work and toward specific occupations," helping to break the cycle of unemployment that begins for many people with youth joblessness.

But the study showed that the project wasn't too successful in keeping the kids in school. The statistics were slightly tilted toward encouraging school attendance, but not enough to be relied on, researchers said. However, the jobs did not encourage kids to drop out of school, which some studies have shown happens if youth jobs are not tied to school attendance.

Copies of the report, "Post-Program Impacts of the Youth Incentive Entitlement Pilot Projects," can be obtained from Manpower Demonstration Research Corp., Three Park Ave., New York, NY 10016.

JTPA competencies developed. A little-known requirement of the Job Training Partnership Act (JTPA), which replaced CETA, is the youth competency system that each grant recipient must develop as part of its 40-percent allocation for youth. The system is a way to measure the ability of the youths to meet basic standards for the attainment of job-related and academic skills. The Jobs Watch Program of the Center for National Policy Review, at Washington's Catholic University of American School of Law, says few JTPA participants have made adequate progress toward developing the competency systems, partially because the U.S. Department of Labor has failed to provide guidelines and standards to be followed.

Vermont is among the states that have come up with a program to do this under JTPA with its Pre-Employment Skills Competencies System, one of the first in



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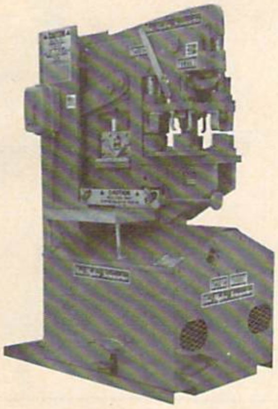

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the nation, the Jobs Watch Program says. When JTPA began there, the Vermont Department of Employment and Training created a group whose priority was to develop these pre-employment skill competencies which were to be used by local jobs service staff and JTPA providers, both to measure skills and to give the state a basis on which to calculate how successful it was in training young people.

The group came up with 23 competencies, including such basics as maintaining an acceptable attendance record, reporting to work or training on time, using appropriate language, using appropriate dress and hygiene, and being free of substance abuse. These and the other competencies were designed to help the participants understand what employers expect and how to show they meet those expectations.

Private groups honored. The Education Department (ED) is finishing up plans to honor private groups which provide help to vocational education in their local areas. ED asked vocational advisory councils in each state to identify one Vocational Institutional Program Advisory Committee that it considers exemplary, and members of those committees will be coming to Washington next month for a fete.

The individual members will be treated to a dinner with about 300 board chairpersons of top U.S. business and education leaders and then recognized for their services to education with a presidential citation, said Robert Worthington, assistant vocational and adult education secretary.

After dinner, the VIP members will stay in town for two days in which ED and other officials will "pick their brains" for ideas, he said. The follow-up will be a guide to be developed by ED on how to use volunteers to improve vo-ed. Many of the VIPs told Worthington they intend to bring examples with them to show the types of work they are doing. For example, students from Florida's culinary arts school will furnish the ice sculptures for the dinner, and a Wisconsin school will demonstrate laser technology, he said.

All over the nation, private groups are helping vo-ed—"you wouldn't believe how many," Worthington said. To find out exactly how many, ED commissioned a study of states to determine the number of people who are donating free time to vo-ed. It found about 40,000 VIP advisory committees, he said, including 1,000 in Wisconsin alone.

President Reagan also has declared this the Year of the Partnership in Education as part of a salute to private sector involvement, he said. And ED is happy to see David R. Weaver, a vice-president of the McGraw-Hill book division in New York, as the new chairperson of the advisory council to the National Center for Research in Vocational Education, he said. ☐

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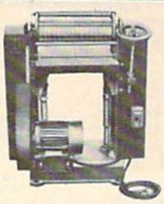

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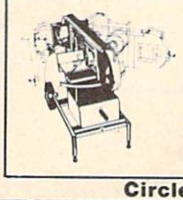

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From Washington

Jobs report discussed. All students should be exposed to some form of education about the world of work, but tracking some into vocational education and others into college-preparatory or general education courses should be avoided. These were among the recommendations stemming from a series of 10 regional hearings sponsored by the Department of Education (ED) last spring.

The hearings were based on the report, "Education for Tomorrow's Jobs," published earlier this year by the National Academy of Sciences and considered the vo-ed equivalent of the famed "A Nation at Risk" report by the National Commission on Excellence in Education.

ED Secretary Terrel Bell scheduled the hearings to ask educators, members of the private sector, and state and local government officials "to pursue with vigor and determination the academy's recommendations for vocational education." More than 1,100 individuals were invited to take part in the discussions where they were asked to come up with ways to implement the report's suggestions, examine how voed is being affected by the academy's and other national reports of the past year and one-half, summarize strategies to help state and local governments improve vo-ed, distribute those strategies nationally, and encourage local and state officials to follow up the regional hearings with seminars in their home areas.

The participants devoted their discussions to four topics suggested by ED, said Robert Worthington, assistant secretary of vocational and adult education. Those were excellence in vocational education, strengthening the teaching staff, improving access to vo-ed programs, and strengthening financing for vo-ed.

Among the recommendations, Worthington said, was a belief that students must learn basic skills in the middle grades before they enter high school vocational education courses. (Some vo-ed advocates have said basic skills instruction should be part of vo-ed courses.) The participants also said schools should avoid setting up separate "tracks" for academic and vocational studies—all students need some type of education regarding the world of work, they said.

In addition, there was agreement that the goals of both vocational and academic education need to be made clearer, taking into account that students, teachers, and administrators in specialized vocational schools tend to be more directed toward goals and more motivated.

As to the teaching profession, the participants said vocational teachers should be given college credit, good toward being certified, for experience earned in the workplace. Vo-ed teachers must be able to demonstrate knowledge of occupational skills and teaching ability before they can be certified or recertified to teach, they said. The groups also recommended internships in business and industry for vocational teachers, although they noted such setups are not widely available now.

Access to vo-ed can be improved by upgrading vocational curricula, counseling, student basic skills, program planning, staff quality, and occupational exploration, the participants agreed. They opposed incentive grants, saying they are not appropriate ways to improve access for 14-18-year-olds and that if they were implemented, training institutions would have to be accredited.

In the final category, financing, the forum invitees most frequently expressed concern that the federal government should provide long-range programs to update vocational buildings and equipment. They also agreed that there should be more flexibility in the way funds can be used to meet unique local and state needs.

The participants also were asked to identify strategies to strengthen the teaching, access, and financing of vo-ed, Worthington said. Suggestions included: business-industry internships for vo-ed teachers, incentives to retain teachers, state councils to promote sharing of resources for vo-ed, "employment insurance" as a companion for unemployment insurance, basing high school graduation requirements on competency rather than courses taken, tax credits to businesses and industries that provide teacher and student internships and provide staff and equipment to help vo-ed, and specific collaborative approaches in training hard-to-place students.

See WASHINGTON, page 88.

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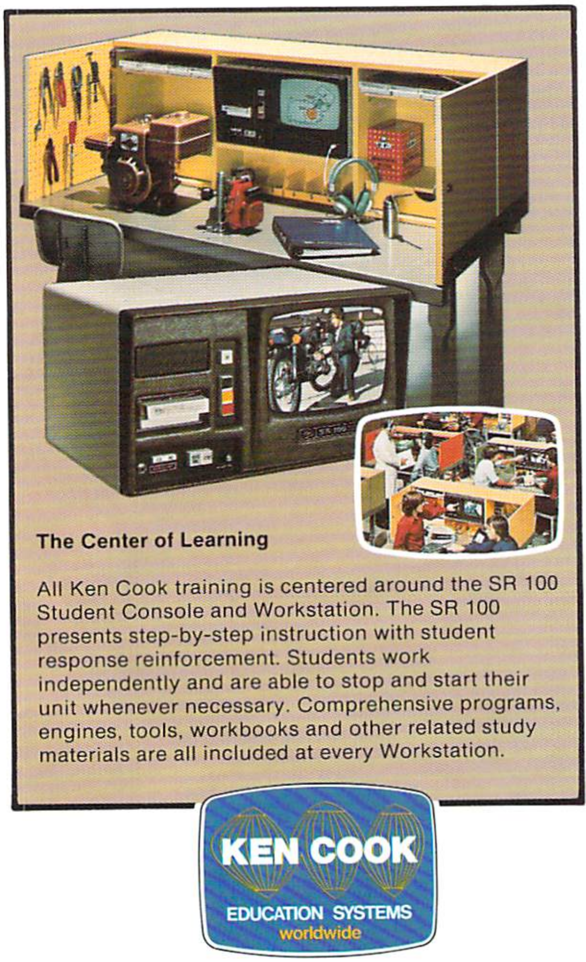

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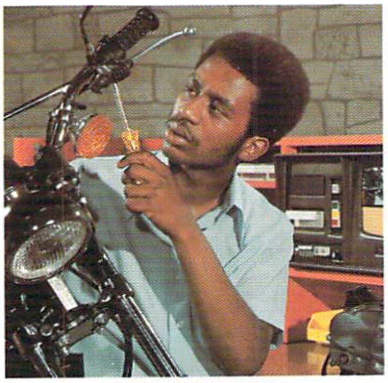

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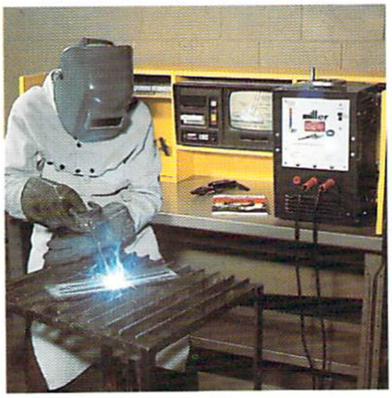

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Telex 26-825

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The potential is boundless.

Potential. In many people it goes unrecognized, undeveloped and unused. That's tragic. Because when a person's potential is never developed a terrible thing happens: nothing.

In the Air Force, we look for potential. And we challenge our people to explore and discover that potential for themselves. First with skill training, then with valuable experience.

We're happy to say it works. For them. For us. And for our country. Because as our people grow, we grow.

Developing potential is part of what aiming high is all about. If we all live up to our potential as individuals, there will be no limits to the potential of our nation.

The Air Force encourages young people to continue their education. Then, with diploma or degree, to accept the challenges of modern technology. For information about these challenges in the Air Force, call 1-800-423-USAF (in California 1-800-232-USAF) or contact a local Air Force recruiter.

AIR FORCE

A great way of life.

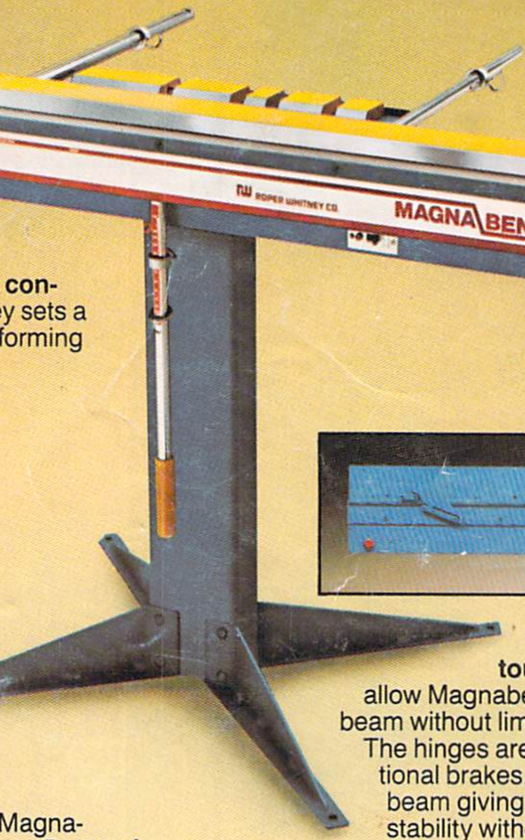
Circle No. 2

ROPER WHITNEY

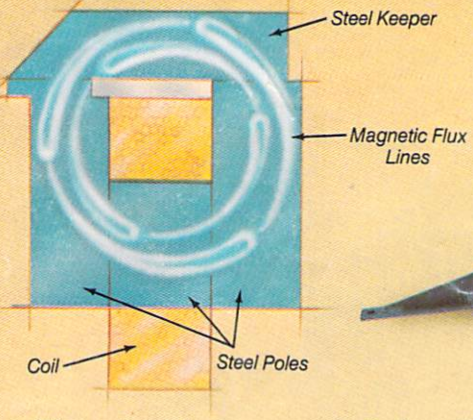
MAGNABEND

Electromagnetic Sheet Metal Bending Brake

... light ferrous and non-ferrous sheet metal forming will never be the same

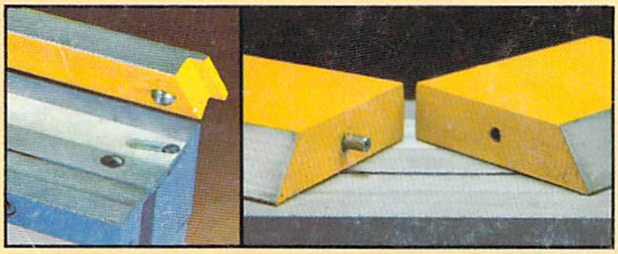


Performance characteristics that no conventional brake can match. Roper Whitney sets a new standard for innovation in sheet metal forming with Magnabend.



The unique electromagnetic design of Magnabend's keeper clamping system provides up to 5 tons of clamping force for bends in light ferrous and non-ferrous sheet metal—up to 4′ wide, 18 ga. Keepers are simply positioned over the workpiece and are magnetically clamped in place when the bending beam is raised.

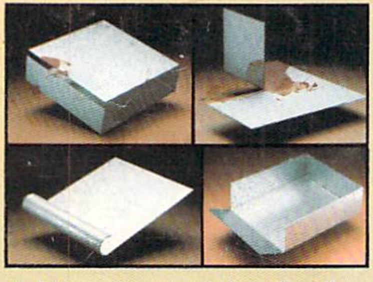
Upper beam and complex finger arrangements are eliminated. With Magnabend, there is no upper beam to get in the way and no elaborate dismantling procedure for brake fingers. For quick changes, you need only to position the sheet metal, the keeper and begin production. A full length keeper and 10 shorter keepers in varying sizes are furnished. The full length keeper has spring-loaded locator balls which rest in grooves for positioning on the workpiece. The shorter keepers are equipped with pins for ease of connection to accommodate any size work. Clearance on the keepers is self-adjusted for varying material thicknesses.



Triple hinge system—tough, reliable. Three hinges allow Magnabend to have a lighter bending beam without limiting durability and reliability. The hinges are not on the ends like conventional brakes. They're underneath the beam giving the bending edge greater stability without deflection along its entire length for wider bends with maximum precision.

And there's more for convenience, production efficiency, safety. Magnabend features bend angle and back gauges for precise, efficient repeat bends. Plus a two-hand safety interlock system.

Magnabend makes complex bends simple. Unique keeper clamping system, open-ended design and single post stand virtually eliminate restrictions on workpiece positioning during bending. Closed shapes and partial length bends are easily performed. Rolled edges up to 330° can be formed with a round bar. And box depth is unrestricted. Magnabend can handle all your complex or regular shapes in a much simpler, less time consuming and efficient manner.



... get all the details. Complete information is contained in our new Magnabend brochure. For a free copy, see your Roper Whitney distributor or contact Roper Whitney Co., 2833 Huffman Blvd., Rockford, IL 61101, (815) 962-3011.

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Circle No. 3